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THE MICROSCOPE

AND ITS RELATION TO

Medicine and Pharmacy.

EDITED AND PUBLISHED BY

CHAS. H. STOWELL, M. D.,

ASSISTANT PROFESSOR OF PHYSIOLOGY AND HISTOLOGY, UNIVERSITY OF MICHIGAN.

LOUISA REED STOWELL, M.S,

ASSISTANT IN MICROSCOPICAL BOTANY, UNIVERSITY OF MICHIGAN.

AN ILLUSTRATED BI-MONTHLY JOURNAL.

ANN ARBOR. MICH.

Vol. 3.

DETROIT!

GEORGE S. DAVIS.

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An Illustrated Monthly Journal.

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VOLUME III.

DETROIT:

GEORGE S. DAVIS.

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THE MICROSCOPE

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MEDICINE AND PHARMACY.

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Original Communications.

ON A PARASITE ON OR IN THE RED BLOOD CORPUSCLES OF A TERRAPIN.

IN making a series of investigations on the blood of terrapins, we accidentally discovered a worm-like parasite in the blood of the sternothærus odoratus, of which we give a number of drawings from the camera lucida, finished and colored by G. A. Peple, Esq., secretary of the Richmond Microscopical Society.

In preparing the blood we employed the following method: The blood was drawn directly from a wound on the leg of the animal to the slide, and immediately spread in a very thin film by quickly drawing over it the straight edge of a smoothly-ground glass slip, and then exposed to the fumes of a 1 per cent. solution of osmic acid for 10 minutes. The blood was then stained and mounted in a solution of hæmatoxylin in glycerine, formulæ of M. J. Renaut, *Archives de Physiologie*, August, 1881, p. 640, ft.

Unfortunately we have only one slide of the blood from this animal, as it was sacrificed for the purpose of making a preparation

from the mesentery to show capillaries containing blood elements. Fortunately, however, for our purpose, the blood corpuscles in the capillaries show a number of the same parasites seen on the slide just mentioned. Both the preparations from the mesentery and the slide with blood were exhibited at a meeting of the Richmond Microscopical Society.

There are two forms of this worm-like parasite seen on the slide: the one, which we consider the immature form, is by far the most numerous and is invariably in connection with the blood corpuscles (Figures 3, 5, 6, 7, 8, 9, 10). There is a difference of opinion between us: one of us believing that some of these parasites are within the blood corpuscle, while the other is of the opinion that they are invariably on the outside. Those which are on the outside, about which we both agree, are figured in Nos. 4, 8, 9 and 10.

The mature form is always seen free among the blood corpuscles (Figures 1 and 2), and is comparatively scarce. We have been unable to trace the exact transition from the one form to the other. The immature form is invariably curved and sometimes adhering only by its two ends to the corpuscles, leaving the central portion unattached, as seen in Fig. 8, where another corpuscle has wedged itself between the worm and the corpuscle to which it is attached.

The nuclei of the corpuscles which are infested with these parasites have invariably an eccentric displacement.

On the concave surface of the worm the staining shows a darkish line, as seen in Figures 3, 5 and 6.

There are a few instances where the corpuscles have two parasites, as in Fig. 7.

In Fig. 4 one of the immature forms adheres to the corpuscle only by one of its extremities, the other floating free.

We would especially call attention to Figures 9 and 10. In Fig. 9 the surface of the corpuscle is wrinkled and puckered by one extremity of the worm apparently attempting to enter the corpuscle. No. 10 shows the completion of the act commenced by No. 9. Here the worm has torn and entered the corpuscle. The wrinkling in No. 9 and the ragged torn edge in No. 10 indicate clearly to our mind that the corpuscles have a distinct envelope. We are perfectly aware that we are treading upon disputed ground, and we would have some hesitation in expressing ourselves in so decided a manner if we had not the authority of Ranvier, who has clearly

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

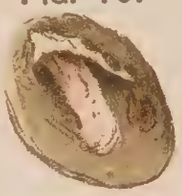
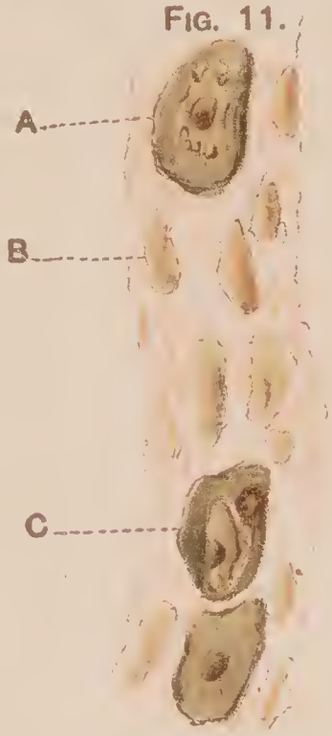


FIG. 11.



demonstrated the existence of the envelope. (See Ranvier, Action of Alcohol on the Corpuscle, *Traite Technique D' Histologie*, p. 193, Paris, 1875).

We are inclined to think that the curved position of these parasites is not due to any tetanic action produced by the osmic acid, as the position of No. 8 must have been assumed anterior to any action of the osmic acid upon it.

That the action of these parasites is destructive to these corpuscles is clearly shown by Figures 9 and 10. They may cling to them or inhabit them for the purpose of feeding on them, as well as receiving oxygen, of which the corpuscles are the carriers.

A large proportion of the corpuscles have upon them a number of white spots, about the exact nature of which we are not prepared at present to express an opinion. They may be or at least resemble somewhat the vacuoli described by different authors. These spots are seen in the blood of other terrapins, which contains no parasites.

Fig. 11 shows the blood corpuscles and parasites in the capillaries of the mensentery.

As to the coloring of the accompanying Figures, they are as accurate as it was possible to get them, and we are greatly indebted to the artistic skill of Mr. Peple on that account.

We simply record what we have seen without expressing any positive opinion. In what relation this parasite stands to the Dupanidium ranarum or Gaule's Wuermchen in frog's blood, as described by Prof. Ray Lankester, in the *Quarterly Journal Microscopical Science*, January, 1882, or to the Fillariae, of which the Fillaria sanguis hominis, discovered by Wucherer, is a notable example, we leave those to determine who have better facilities.

Wm. R. Weisiger, M. D, Manchester, Va.
Rev. Ed. Huber, Baltimore, Md.

DESCRIPTION OF PLATE.

Figures 1, 2, 3, 4, 5, 6, 7 and 8 taken with a 1/8 im. of Powell & Lealand A eye piece.

Figures 9 and 10, with Tolles' $\frac{1}{12}$ im. A eye piece.

Figure 11, is a capillary from the mesentery of the animal with contained blood corpuscles.

A.—Corpuscle with vacuolæ.

B.—Nucleus of capillary.

C.—Blood corpuscle with parasite on it.

MALASSEZ'S IMPROVED COMPTE-GLOBULES.

BY C. H. STOWELL.

SOME four months ago an order was given to James W. Queen & Co. to procure from Verick, of Paris, one of these corpuscle-counters. I regret that the apparatus, that has just arrived, cannot be fully illustrated with this description. If possible the cuts will be procured and the illustrations given in some future number. It is with this instrument that I intended to conduct a series of exhaustive experiments, the results of which were to be imbodied in a paper, already announced for the meeting of the American Society in Chicago. A few months illness, however, overthrows many plans, and doubtless the Chicago meeting will be a thing of the past before the eye can be placed again over the tube of the microscope.

The following description of the instrument is taken largely from the *Royal Microscopical Journal* for August, 1882:

This improved apparatus consists of a thick brass slide, having in the center an aperture, into which is fixed a circular glass block about a centimetre in diameter, with its upper surface level with the top of the slide, and surrounded by a groove about half the thickness of the slide in depth. Outside this groove are three pointed metal screws, equi-distant from each other, the elevation of which above the surface of the slide is exactly $\frac{1}{5}$ mm. In the center of the glass block the squares are drawn in which the corpuscles are counted. The sides of these are $\frac{1}{20}$ mm., and they are arranged in groups of twenty.

To facilitate lowering the cover-glass so as to be exactly horizontal, Malassez devised the frame to the underneath part of which the edges of the cover-glass are attached by a little water or saliva. The frame is supported on two arms, attached to one flange of a hinge, the other flange being secured to the side by a clasping screw. The frame with the cover-glass is raised or lowered by the longer of the two arms, and the operation may be quickly performed. A small spring clip keeps the whole down, so that there is no danger of the cover being raised or displaced.

The whole apparatus, in a neat morocco case, costs about $25.00.

BACILLUS.

BY J. M. ADAMS.

IF the late idea advanced be true—that the bacillus be nothing but fat cells modified—then it would not hold good that they exist where no fat exists, particularly where the fat has all been absorbed.

I once found a spring-poor old bat, so poor that he was about dead and had nothing but a few feathers over his lean flesh and bones, and yet his blood, as well as muscles and lungs, were literally filled with well-formed bacilli. He was really poisoned to death by these numerous bacilli, and not a granule of fat could be supposed to exist anywhere in or about them, and they multiplied all the more, the more diseased the animal became—no fat to absorb, no fat could exist in such a state, and no fat at all.

CRYSTALS OF SODIUM CHLORIDE.

BY E. E. JACKSON.

A VERY instructive and simple experiment to exhibit crystals of sodium chloride under a low microscopic power, say $\frac{1}{2}$, is to mix on a slide a little solution of salt and alcohol. As the alcohol seizes the water the salt crystalizes in *clear brilliant* cubes, the heat generated by the union of alcohol and water causes evaporation and a steady tumbling over of the perfect cubes. Perhaps this is not new.

I have frequently used liq. pot. and sol. tart. acid to obtain pretty crystals of cream tartar to amuse friends. Using potassium it is quick and handsome.

THE BIOPLASSON THEORY OF HEITZMANN—A REVIEW OF HEITZMANN'S "MICROSCOPICAL MORPHOLOGY."

BY C. H. STOWELL.

SOME three years ago my attention was seriously called to the reticulated structure of tissues. Since that time the subject has received more or less attention, and for a few weeks before my

sudden illness in December last, it had occupied all of my time outside of my college duties. It was with a feeling of disappointment that Dr. Heitzmann's work was read. He does not give the reader that feeling of satisfaction, which should make him involuntarily exclaim, "He knows all about it."

But to the book itself.

On page 1 under "Methods" we are told, that the tearing and teasing of tissues is a most objectionable method of preparation, while all working histologists know that it is an indispensable procedure for many examinations.

On page 8 we read that: "The process of mounting in glycerine is simpler and easier than any other method." The next sentence reads: "Glycerine specimens need more careful handling than balsam specimens." How does the reader reconcile these contradictory statements?

The two sentences following the above describe the many difficulties in the way of getting good glycerine mounts, and the paragraph closes thus: "The mounting and varnishing of glycerine specimens is easier with square than with circular covering-glasses." How this sounds to the practical microscopist! Did the author never see a turn-table?

"Hæmatoxylin and eosine are reagents used exclusively for alcoholic specimens, but not suitable for chromic acid preparations." This is not in accord with the experience of many workers.

After reading this all important chapter, the following conclusions are reached: first, no methods are given especially adapted to show reticulated structure; second, many statements are contrary to the experience of practical working microscopists; and third, there are actual contradictions. The above is neither an inaccurate nor overdrawn view of the "Methods" that are to overthrow all the theories of the past concerning the structure of tissues.

The list of contributors to this volume numbers as high as twenty, and is composed of those who have worked in Dr. Heitzmann's laboratory.

In the preface we are told that, "over 700 attendants have satisfied themselves of the correctness of my assertions." Hence it should not be a difficult matter to find 20 from the 700 who would be willing to contribute to the literature of the subject. A large

number of the articles are reprints, having appeared first anywhere from ten to fifteen years ago (see page xviii).

On page 28 is the following: "I have collected a number of facts, observable by everyone who has a well-versed eye and a good lens." Therefore if anyone is unable to see this reticulated structure, he has either a poor eye or a poor lens.

"Protoplasm, therefore, is not structureless, but has a reticulum, and the granules are not foreign but belong to the protoplasm." "The nucleolus, nucleus and the granules with their connecting filaments are the living or contractile matter proper."

On page 56 we read: "There is no such thing as an isolated individual cell in the tissues." On page 57, "The plant *in toto* is an individual, and not composed of individual cells."

On page 59 is the following: "Pus corpuscles show remarkable differences in their minute structure in different iudividuals." He says that pus corpuscles have been brought to him hundreds of times, to tell whether the pus was from good or bad constitutions, and he adds: "I was right in every instance, not one mistake occurred."

On page 60 he tells us that he has "arrived at a point of perfection which allows me to tell the constitution of a person without knowing anything of his former life." "The better the constitution the fewer are the colorless blood-corpuscles."

On page 61 the very climax of all that is absurd and ridiculous is reached. It reads as follows: "Life insurance should be based upon microscopical examination, as well as on percussion and auscultation. Marriage should be allowed, in doubtful cases, only upon the permit of a reliable microscopist. Last season a young physician asked me whether I believed in the marriage among kindred. He fell in love with his cousin and so did the cousin with him. I examined his blood and told him that he was a "nervous" man, passing sleepless nights and had a moderately good constitution. The condition being suspected in the kindred lady, marriage was not advisable for fear that the offspring might degenerate. So great was his faith in my assertions that he gave up the idea of marrying his cousin—offering her the last chance viz., the examination of her blood. This beautiful girl came to my laboratory, and, very much to my surprise, I found upon the examination of her

blood a first-class constitution. The next day I told the gentleman, "you had better marry her."

"The first conclusion to be drawn from my researches is that in no tissue whatever do there exist 'cells' as isolated individuals."

The animal body is one protoplasmic mass, in which are embedded a relatively small number of isolated protoplasmic corpuscles and various other non-living substances." (Page 132).

Thus he calls the migrating corpuscles and the colored and colorless blood corpuscles "non-living substances."

On page 135 he says that, "In the light of my investigations the cell theory had to be abandoned." Yet this is the only theory advocated to-day by the great majority of biologists. Histologists will be paralyzed to learn that, "on cartilage tissue have mainly rested, for the last forty years, our biological views." (Page 141).

Our dental readers will learn of structure found in teeth that they never dreamed could exist.

"Extremely fine thorns traverse in a vertical direction the light space between two neighboring enamel rods, even where a fibre is not visable." (Page 622).

"The enamel is traversed by fibres of living matter located in the interstices between the enamel rods." (Page 624).

On page 797, under the subject of "urine," we are told, "The pus corpuscles are the best material for determining the general constitution of the patient, his chances for recovery, or the probable duration of his life."

From the above extracts the reader will form some idea of the book and its author. I believe the bioplasson theory of Heitzmann to be the merest nonsense of the most shallow character emenating from an egotistical and eccentric brain.

The subject, however, cannot be dismissed with a sneer, but must be judged upon its merits.

Now I open Dr. Heitzmann's book and with the utmost possible care I follow his directions. I examine the tissue thus prepared with the various glasses at my command. I apply the $\frac{1}{50}$ objective which will stand the tests given on another page of this journal, and yet nothing like a reticulum is seen. Dr. Heitzmann would reply to me as he has to others, "insufficient eye-training." "It took me fifteen years to see what I can readily see now."

Yet in the face of all this, I unhesitatingly declare that if I can

take a $\frac{1}{50}$ objective and dot and bead the *s. gemma* and resolve the amphipleura pellucida, I am able to see a reticulum if it is present.

On page 268 of the Proceedings of the American Society of Microscopists for 1882, Dr. Fell, the treasurer of said society, says he has "failed to see the reticulated structure though strictly following the directions of Dr. Heitzmann and using objectives of high angle."

Dr. Up de Graff "could see no such structure, except when the lens was in the wrong adjustment."

Dr. J. O. Stillson said he had been a pupil of Dr. Heitzmann and had seen the doctor demonstrate this structure to his pupils and they would assent to it; "but," he adds, "I confess that I have never been able, though using the best modern lenses, to demonstrate the existence of this structure to myself in private work."

Dr. Mercer said he could find no such structure; "moreover, if such a structure should appear, it would be so fine that it would come under Abbe's diffraction laws."

Mr. E. S. Mott had seen this structure, "when the corpuscle was slightly out of focus."

Dr. Geo. E. Blackham, President of the American Society, comes out boldly on page 271 and says that while a guest of Dr. Heitzmann, the doctor demonstrated this structure to him, but it was his private opinion at the time that the doctor's glass was out of focus. He could not see this structure at home.

While the illustrations in this work are finely executed, yet many are so highly diagrammatic that they are of little value. As a writer, not much can be said in the author's favor. From beginning to end there is too much of this "I have arrived at that degree of perfection, etc."

The publishers, J. H. Vail & Co., New York, have bestowed great care on the work.

The drawings are admirably executed. The type, paper and binding are of the highest order.

RESOLVING AMPHIPLEURA PELLUCIDA WITH CENTRAL LIGHT.

BY B. W. THOMAS.

UNDER date of February 18, 1883, Prof. S. A. Forbes, State Entomologist and Director of the State Laboratory of Natural History, at Normal, Ill., wrote: "How much of a feat is it to resolve

a pellucida in balsam (Moller's test plate) with entire clearness (as to lines) by mathematically central sunlight and without accessory apparatus of any kind? I find that I can do it with great care with my new Spencer $\frac{1}{10}$ homog. immer. and one inch eye piece, giving a power of only about 650." This was new to me, and I answered that I had never seen a pellucida resolved by central light and was not aware that it could be done with any lens yet made. March 2d I received a second letter from Prof. F., in which he more fully describes his methods as follows. (See his letter of March 2d, No. 1). This letter I sent to Mr. Charles Stodder, the well-known microscopist of Boston. Mr. Stodder replied that Dr. H. J. Detmers, of the U. S. Department of Agriculture, had done the same thing with a Tolles $\frac{1}{10}$ homog. immer. made for him about 1878, and R. B. Tolles, Esq., the veteran maker of our best lenses, sent a note saying that "A. Y. Moore wrote a year or more ago that a $\frac{1}{10}$ water immer. duplex made for J. E. S. (Prof. Smith, of Cleveland, I suppose), in 1874, did the same thing by central sunlight." Dr. Detmers, after advising me of his success in accomplishing the same feat, writes as follows. (See his letter of March 12, 1883, No. 2). But it is *possible* that either Dr. Detmers or Mr. Tolles may be in error. I requested Prof. Forbes to try the effect of shutting off all possible oblique rays of light by interposing two diaphragms between the mirror and slide. He kindly complied, and under date of March 17th, writes as follows. (See his letter of March 17th, No. 3). This seems to be thorough, and, so far as I know, is new to almost all microscopists, and it may be of as much interest to others as it has been to me, and it may involve some principle that can be made of value in other investigations.

CHICAGO, March 23, 1883.

OFFICE OF STATE ENTOMOLOGIST,
NORMAL, Ill., March 1, 1883.

FRIEND THOMAS—You are right in supposing that my objective resolves *Amphipleura pellucida* by light which is *strictly central*, and without the aid of any accessories whatever. The resolution is perfect all over the diatom, and so clear that any one can see it at a glance. It is distinct, even with the camera lucida, and I have been able by that means to measure and count the striæ, making between 95,000 and 100,000 to the inch. My first results were got by the

use of direct sunlight with the central mirror, but taking the light from the edge of the reflector, where the illumination was good, but not intense. I found upon calculation, however, that this gave the light an obliquity of about 10°; and then, swinging the mirror 10° to one side, so as to bring the edge reflecting the light used directly in the optical axis, I obtained still the same admirable results. I have done this again and again without the slightest difficulty, and shown the diatom to a considerable number, who recognized the transverse lines without any difficulty whatever.

Sincerely yours,

S. A. FORBES.

CHAMPAIGN, Ill., March 12, 1883.

B. W. Thomas, Esq., 27 Portland Block Chicago, Ill.:

MY DEAR SIR:—Please inform our friends that I have succeeded in finding out what reflects the light in resolving amphipleura by sunlight, mirror central. It is nothing but the immersion (homog.) fluid, which, if extending to epodisc argus, acts like a lens above the object. The nearer perfect the lens, the better the resolution.

Yours very respectfully,

H. J. DETMERS.

OFFICE OF STATE ENTOMOLOGIST,
NORMAL, Ill., March 17, 1883.

DEAR MR. THOMAS—I have just tried your experiment with the diaphragm, varying it, however, by darkening the mirror instead of using two preparations. When the mirror is all darkened, except a circular area 4 mm. in diameter, directly sub-central, the resolution is still perfect. I have had the objective loaded at the same time to cut off light from above. There is no question that the light is directly central until it reaches the slide. What becomes of it then is another question which I haven't time to work at. I think it possible, however, that some of the rays outside the field of the microscope get reflected back and forth between the glass surfaces, and finally reach the object. As the light comes from a concave surface, many of these rays must be slightly oblique to the slide, no matter how small a part of the mirror is used, and a very slight obliquity would be sufficient to start these reflections.

I found that I had a slide of your amphipleura from Fox Lake [The striæ on these a pellucida, as counted by Dr. Detmers, are 116,000 to the inch.—B. W. T.], and these specimens were resolved without difficulty in the same way. It is certain that no light comes from the adjacent diatoms or from the edges of the cover.

Truly yours,

S. A. FORBES.

LABORATORY NOTES.

BY C. H. STOWELL.

A PHYSICIAN residing in the central part of the state forwarded a two-ounce vial to this laboratory. He said the bottle contained a worm about six inches in length, one-eighth inch in width, and quite thin. This worm was voided with the urine of one of his patients, who was suffering from an acute attack of cystitis. After the passage of the worm the inflammatory symptoms subsided and the patient made a rapid recovery.

In the presence of my laboratory class, I cut off about a quarter of an inch of this "worm," teased it to pieces with needles, and

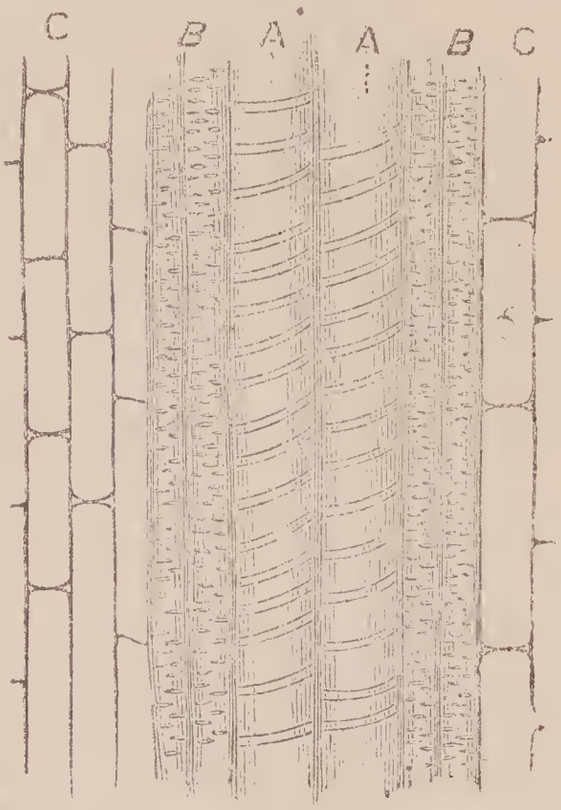


FIG. 1. LONGITUDINAL SECTION OF STRAW.

A, Spiral Vessels. B, Pitted Vessels. C, Regular Parenchymatous Cells. Drawn with Camera Lucida, X 375.

examined it with a one-fourth inch objective. We all saw the beautiful spiral vessels and cells of the vegetable kingdom. (See figures 1 and 2.)

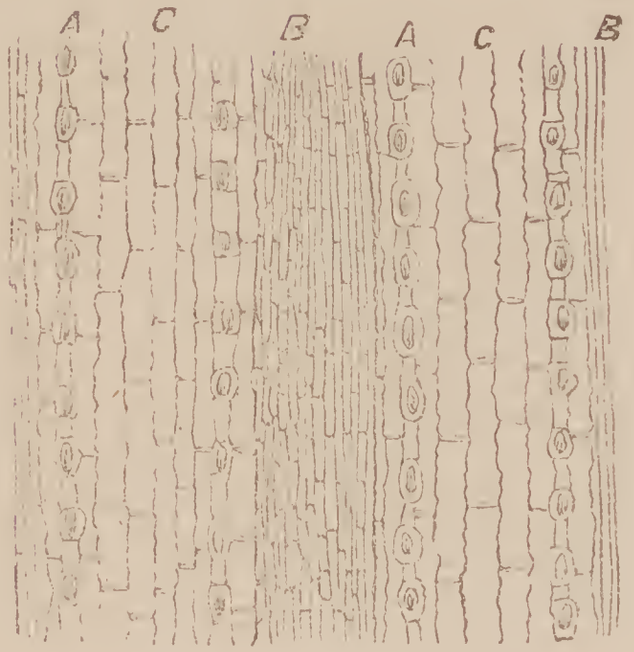


FIG. 2. EPIDERMIS OF STRAW.

A, Rows of Stomata. B, Opposite, or over the Vascular Bundles seen at A, Fig. 1. Drawn with Camera Lucida, X 75.

The microscope had resolved the "worm" into the fragments, of a longitudinal part of a straw.

JOURNAL DE MICROGRAPHIE (JAN. AND FEB. NUMBERS 1883)—VIEWS OF THE EDITOR ON THE GERM THEORY IN DISEASE—ANNOUNCEMENT OF A SERIES OF PAPERS BY PROF. BALBIANI OF THE COLLEGE OF FRANCE.

ABSTRACTED FROM THE FRENCH BY LORIN HALL, A. M., M. D., ASSISTANT IN MICROSCOPY, UNIVERSITY OF MICHIGAN.

IN the January and February numbers of the "Journal de Micrographie," edited by Dr. J. Pelletan, is a review by the editor, of the "Micro-Organism" as referring to disease. The position taken is a negative one, the author preferring not to believe because of insufficient proof. The hold which the theory has taken upon the scientific world, he explains by saying, that the theory is so simple, and explains so readily and simply many heretofore inexplicable

facts, hence the human mind is only too glad to welcome it. Pasteur's influence, too, is so great, that many who are not yet convinced, and are not likely to be, are afraid to rise up in opposition to this doctrine. Disease exists, because it exists! and as to why, or how it exists, he quotes Molèir's explanation of the soporific effects of opium:

"Quia est in eo
Virtus dormitiva
Cujus est natura
Sensus assoupire."

The micro-organism found in some diseased conditions is a result, of the condition rather the cause of it, so the matter appears to many who presumably, are among these afraid to oppose a theory so well supported. Instancing the germ in erysipelas, in syphilis, (the career of which has not been very favorable), and that in rubeola, he says, in particular of the latter, it is almost absurd to give any weight to the possible influence of the germ as a cause of the disease, or as influencing the course of the same, or as existing in the course of the disease necessarily. The question very naturally arises, why is not the urine only a suitable nidus, chemically, for the existence and the proper propagation of the bacteria found therein. Their presence, then, proves nothing, and if it is a cause of rubeola, as is affirmed by M. Lebel, why is it, if it exist, that it comes and goes, is so fickle as to its presence in a given place, and why do we have epidemics; why not have a case any time!

Such is the error of the review, simply statements of opinions rather than of convictions based upon the knowledge of scientific facts, gained from experimental study.

We find in the January number of the journal, the announcement of a series of papers by Prof. Balbiani, of the college of France, in the development of the arthropodes (crustaceans, insects, *et al.*). These topics will be treated of in the lecture course this year at the college of France by Prof. Balbiani.

OUR NEW ONE-FIFTIETH OBJECTIVE.

BY C. H. STOWELL.

ABOUT two years ago an order was given to the firm of Chas. Spencer & Co., Geneva, N. Y., for a one-fiftieth objective. The dissolution of this firm caused serious delay in filling the order

and it was over a year before the glass was finished. It was, however, finally completed by Mr. Herbert Spencer. The objective has four systems with the following diameters:

Diameter of back system, - -	.0733 of an inch.
Diameter of middle system, - - -	.0666 of an inch.
Diameter of secondary front system, -	.0444 of an inch.
Diameter of front system, - - -	.02 of an inch.

The utilized diameter of the back lens is .065 of an inch. It has 100° balsam angle, equivalent to about 1.17 numerical aperture. It is adjusted to work with either homogeneous immersion fluid, glycerine or water.

The total thickness of the four systems, from the front surface of the front lens, to the back surface of the back lens is, .075 of an inch. The working distance is about $\frac{1}{200}$ of an inch.

Placing the objective on one of Fasoldts test plates the observer is astonished at the nice definition and flatness of field. The lines are sharply in focus in every part of the field.

With its use the *S. gemma* is dotted and beaded elegantly. The *amphipleura pellucida* is resolved very clearly.

A private letter from Prof. H. L. Smith, of Geneva, N. Y., says: "The performance of this objective surprises me. Its work on the *podura* is very fine, even up to 9000 diameters. I once had a $\frac{1}{50}$ made by an English house as well as one made by a celebrated American optician. I need not say that this one of yours surpasses them both in mechanical construction and in performance. It far surpasses anything I have yet seen."

Mr. Spencer says: "I believe it to be the best $\frac{1}{50}$ ever made."

I use this objective on a common stand, with only ordinary means for illumination. It has been used at all times of the day, and with many different kinds of light, yet never has it failed, both to excite our admiration and to satisfy our expectations.

With this superior glass I determined to do two things; by the use of my cobweb eye piece micrometer, to more accurately measure small objects; and also to settle in my own mind, if possible, the question of "Heitzmann's reticulated structure of tissues." With what success I have pursued, my investigations on various bioplasts, I fully describe in this number of the journal.

More may be said in favor of this objective, catalogued at $270.00, in future numbers of THE MICROSCOPE.

THE MICROSCOPE IN MEDICINE.

BY E. E. JACKSON.

SOME time has elapsed since I promised to send you some notes from my record of microscopic work. I have selected this item to illustrate the value of the instrument in correct diagnosis.

In May last, a physician handed me a small paper containing fragments which resembled, to unassisted vision, a small crust of dried blood and serum, requesting microscopic examination, the result of which (with ¼ Beck) proved to be starch granules, the polarizer confirming it with the cross so peculiar to the starches, as did also the test of iodine; a maceration in a warm solution of soda revealed the spiral and long vessels of the skin of a pea, and an operation removing this foreign body from the ear of a patient produced a pea which had lodged on the drum, ten years previously, causing much suffering with neuralgia, headache, deafness, etc. The result of the operation is satisfactory—hearing perfectly restored, and no more neuralgia or headache.

As the form of the starch granules was not identical with those with which I was familiar, or had reference to, I examined a cow-pea, and found form, size corresponding, also the same layer of cells underlying the cuticle.

The preservation of the starch granules by the cerumen for ten years without forming an abscess is remarkable. I omit many interesting particulars concerning the case, as the physician will probably report it in full. By the way, he is one of your subscribers.

An M. D. placed on my table a two-ounce vial, saying: "Look at that urine and give me a report." I did so, mentioning that the case was similar to Mr. P.'s, who was a patient of his and a neighbor of mine. "Oh no," he said, laughing, "this is a lady's, and not in the least similar." Just as I was on the point of proving my assertion, the gentleman referred to appeared at the door, saying: "Doctor, did you examine my urine in that two-ounce vial?" Of course, that explained all. Neither bottle had a label, and both were two-ounce vials. I will mention here the peculiarity of Mr. P.'s urine: There was always present some blood, and often crystals of uric acid, but more than half of the corpuscles had small buds; sometimes one, often three. I have never discovered any similar cases.

VEGETABLE CELLS AND STRIATED MUSCLE.

A FEW days ago an agent called at my laboratory to urge the necessity of my purchasing a new encyclopedia. He found me at work in my private dissecting room. This led him to inquire if I were an M. D. I was obliged to inform him that I had never attended medical lectures, although I had done some work in practical anatomy and had read medical works.

"Then did you ever hear of the tape-worm?" he asked.

I at once showed him specimens, both macroscopically and microscopically.

This conversation resulted in his telling that he had been under treatment for that trouble for some time without relief. Three physicians had prescribed the various anthelmintics with no cure. They succeeded only in removing the "egg cases." Some of these "cases" were brought the next day for me to examine with the microscope. They were resolved into the striated muscle fibre of the animal kingdom and the cells, vessels, etc., of the vegetable kingdom. I made a rash guess and accused my patient of having eaten mince pie for his supper the day before. He confessed that he did so each evening, "if it was to be had." A cessation of the pie caused a disappearance of all the symptoms of tænia, and a lighter-hearted man left town; so light-hearted was he that he forgot even to thank my microscope for what it had accomplished.

T. B. S.

BACTERIA, THE CAUSE OF CARIES.—In conclusion, then, in order to be correctly understood, we repeat that acids are not the cause of carious tooth structure. The real cause is bacteria inaugurated by air germs through first ferment. All pits, fissures, abraded, hidden, and all inaccessible places in and around the teeth, where particles of food or foreign matters of any kind are lodged and unmolested, organism follows organism, absorbing the bioplasm in the canaliculi, leaving the limey substance to disintegrate. The change of shade is caused by the pigment in the protoplasm of bacteria, which is light, yellow, brown or dark, according to organic advancement.—*Independent Practitioner.*

Editorial Department.

THREE months of severe illness (cerebritis) will overthrow the plans of anyone. Disease will not consult our convenience, but visits us just when it will be most unwelcome. At half-past nine o'clock on the morning of December 11th we were engaged in lecturing and an hour later we were in a hard chill which lasted for nearly three hours.

For three months we were trying to learn the lesson how to bear suffering with patience and submission. Active delirium rendered a part of this time a perfect blank, and we awoke from the long, terrible dream to find parents, brothers and sister near us. A whole winter has passed away and has left its record with us only in a trembling hand and an aching head.

How it is that we are able to write this editorial after all hopes of our recovery had been abandoned, time and time again, by such eminent council, we are at a loss to say. Perhaps the three following reasons will explain the matter:

First—A strong, vigorous constitution. An ounce of tobacco or alcohol never entered the body to weaken and poison the nervous system.

Second—The best of care. Aside from those of our own household, there is one whose name will ever be associated with all that is kind and true. Day after day, night after night, found Dr. George A. Hendricks at our bedside, ever with watchful eye and untiring hand.

Third—Superior medical skill. That faithfulness and unselfishness are leading traits in the lives of medical men is a well-known fact. An active mind and a ripe experience, combined with these qualities, enabled Prof. Palmer to prescribe those remedies which combatted disease in such a wonderful manner.

WE TAKE the liberty of copying the following from a private letter received from Prof. D. S. Kellicott, Secretary of the American Society:

"The executive committee of the A. S. M. held a business meeting in the Genesee House, Buffalo, March 10.

"The members of the committee present were Dr. George E.

Blackham, H. F. Atwood, Geo. E. Fell, D. S. Kellicott, Mr. Ed. Bausch. Mr. Henry Mills and Dr. W. C. Barrett, members of the society were present and participated.

"Eight duly signed recommendations to membership were presented and approved. From information in the hands of the committee it is safe to say the attendance at Chicago will be large and the number and character of the papers will be such that the meeting will be one of unusual interest. It was decided to open the meeting at 10 A. M. August 7, and to devote the last hour of each day (4 to 5 P. M.) to the exhibition and explanation of apparatus, objects and methods. The president was requested to issue a circular to microscopists calling attention to the forthcoming meeting. After passing upon matters of executive business, adjourned to meet again in May.

"The president of the Rochester Academy of Sciences informs me that at its late meeting a resolution was adopted asking the society to meet in Rochester in 1884.

"I am assured that the Chicago society will do their part to advance the interests of our meeting. A letter from President McCalla says that everything promises well for the Chicago meeting, a number of valuable papers being already secured. A letter from Mr. Thomas, of Chicago, says a meeting of their society was held recently at which President McCalla was present. This was for the express purpose of making arrangements for August next."

We hope a large number of our subscribers, especially in the west, will apply to Secretary Kellicott at once for the necessary "applications for membership." Address the secretary at Buffalo, N. Y.

OUR readers have before them a journal of 48 pages. Six of these journals are printed for one dollar. We decided to give this enlargement under the firm belief that all, or very nearly all, of our old subscribers would renew. Do not disappoint us in this matter, but send on your renewals at once.

FR. J. EMMERICH appears with us for the first time. He makes a specialty of the optical goods made by Mr. Zeiss and will be glad to quote prices to all. Zeiss's goods need no mention, they are well known everywhere as superior.

THE advertisements in a journal are its very life. Without them this journal—and all others, too—would have to close its accounts. It is a favor to us and also to our advertisers if you will mention this journal when you write for their catalogues or goods. Then read our advertising pages.

OUR readers will remember that the last number of this journal was conducted entirely by the junior editor. She has received hosts of letters congratulating her on its appearance and some of them mildly suggesting that "the senior editor had better resign." Is it possible that married men could give such advice!

WE CALL attention to the new page advertisement of W. S. Woolman. His goods are first-class, hence we are very glad to have him with us. He will send catalogues to those who desire it and will sell you a microscope "cheap for money." The attention of draughtsmen is called to the fine stock of drawing instruments kept by this house.

Edison has constructed for Prof. Fairfield of the New York College of Veterinary Surgeons an electric lamp which makes a 500-candle power in the area of a half-dime. The electrodes or carbon points are only one-tenth of an inch in diameter, the object being to obtain the highest intensity within the smallest possible space. It requires a battery of about forty cells. The instrument was made to illuminate a microscopic objective constructed upon the newly-discovered law of homologous sections.—*New England Journal of Dentistry.*

The discovery of the plax-scindens in oysters and other shell-fish, now that this microbe is known to cause scarlatina, awakens fresh interest in the professional mind. The learned and able Dr. Eklund, of Sweden, hints at the possible vaccinal protection against scarlet fever from the introduction of the schizomycetes which he has found in oysters. It would appear strange if the oyster should supply us with a germ which shall as effectually protect us from scarlatina as that supplied by the cow protects us from the small-pox.—*Medical Herald.*

Selections.

A Method of Making and Mounting Transparent Rock-Sections for Microscopic Slides.—The following method of making and mounting transparent rock-sections for the microscope, was taught me several years ago by the late Mr. Arthur Pratt, of Glasgow. And, with a few exceptions, which will be noted, the method I use is essentially that followed by Mr. Pratt.

The first step is of course to get a suitable piece of rock, say, a fragment of Trap or Basalt.

This should be broken as thin as possible, and to do this, having struck off a fragment from the parent rock, or boulder, take it between the fingers and thumb of the left hand. Hold one edge on the rock from which it was struck, or any hard stone which may be convenient, and strike it a sharp blow with the hammer, fair on the opposite edge. If this is well done thin fragments, about one-eighth of an inch thick, will fly off.

These fragments ought to be rough-hewn, on the spot, so long as there is plenty of material to work from, and for this purpose I use a pair of cutting nippers such as are used for cutting wire. With a little practice, any one will soon become expert in using them. Take a thin fragment of the rock in the left hand, and with the nippers work round it, clipping off the superfluous angles until a disc of about seven-eighths of an inch in diameter is formed. With a little experience this can be done in less than a minute. My practice is to take four such discs, of each kind of rock from which I wish to make sections; two to ensure getting a finished section, and two to meet the requirements of friends.

I also take a thin piece of the rock one inch and a quarter square, or thereabouts, as a cabinet specimen, and for comparison with the finished section. This specimen should, if possible, show a weather-worn face, although it is not always possible to get a specimen in this state, especially if it is taken from a mine, or quarry. The specimens ought to be labelled on the spot, and the most convenient way to do this, is to have with you a quantity of elliptical or circular gummed labels, about three-quarters of an inch in diameter. If the specimen is taken from a Trap Dyke, the thick-

ness or width of the Dyke should be taken, and the particular place from which the specimen was struck noted.

If the Dyke is a wide one, two, or possibly three sections will be required to show its structure. For in wide Dykes, specimens taken from the middle will be found to be softer, and the crystals larger, than specimens taken from near the side of the same Dyke. Mining men are well acquainted with this, and I may mention it as a fact, that in cutting a mine six feet high by six feet wide through a sixteen fathom Dyke, in the Ayrshire Coal Fields, it cost twenty pounds sterling per fathom, to cut the mine near the sides of the dyke, whereas near the centre it was driven for six pounds per fathom. It would be out of place here to enter into an argument of the causes.—First, why Trap Dykes exist at all, and second, why they are harder and more finely "grained" at the sides than they are in the interior. I may just say, for the benefit of those who have not studied these matters, it is the accepted theory, that Dykes have at one time been molten rock, filling up cracks in the earth's crust, and that naturally this molten rock cooled quicker at the sides of the crack that in the center, and consequently the Dyke is more finely cystallized and compact at the sides, than in the interior.

This, then, I hope, will be sufficient reason for saying that more sections than one are required to show the microscopic structure of wide Trap Dyke, or in fact of almost any Dyke.

The student who follows these instructions about chipping and cutting, will be able to take home as many specimens in his pocket as he could otherwise do in a large bag, by the old method of simply using the hammer; and this is no small matter, when one walks perhaps twenty or thirty miles, in a day's hunting after specimens.

Having got safely home with a variety of specimens, the next thing to be done is to make the discs roughly circular, and to flatten and polish one side. To do this, I use a flat slab of polished sandstone, eighteen inches square by four inches thick, on which I rub the edges of the specimen, using water, and giving it a slight turn at every rub; a very little practice will enable anyone to make the discs almost circular. But what is chiefly to be aimed at in making them circular, is to get a smooth edge, as a disc having a perfectly smooth edge will not break so readily in the subsequent process, as a rough-

edged one. It should now measure about five-eighths of an inch in diameter. The flat face must next be polished, so as to remove every trace of scratching caused by the sandstone, and at the same time it is necessary to make this face perfectly flat. To accomplish this, I use a Water-of-Ayr hone, seven inches square, by two and a half inches thick, having one of the faces perfectly flat. On this face the disc is rubbed with water, until it also becomes perfectly flat and free from scratches. It must then be made thoroughly clean and mounted on a piece of hard wood.

I use well-seasoned beech wood, two inches square by three quarters of an inch thick. Fix the disc to the block of beech with gum arabic, putting plenty of the gum round the sides, so as to form a collar, and allow it to harden for two or three days.

The specimen is now to be ground down, until the beech can be seen distinctly through it. It will not do to rub it on the sandstone now, as water would dissolve the gum, and the specimen would be at once detached. For the purpose of rubbing it down, use a flat metal plate, course emery powder, and paraffine, turpentine, or benzoline, as none of these substances will dissolve gum arabic. Mr. Pratt used to rub his specimens down entirely on the metal plate, using finer emery powder as the specimen became thinner. But after it has been reduced to about the twentieth of an inch in thickness, I find I can make more speed by using a Turkish whetstone sprinkled with a little of the finest emery powder, and rubbing on this till the wood may be dimly seen through the specimen. At this stage I clean the specimen, wood, and whetstone, with a piece of rag soaked in turpentine, and rub down on the bare stone, using the same fluid, till the specimen is thin enough to be taken off the wood. Of course, this is the most critical period in the rubbing process, and the period at which one is most apt to lose his temper, for if the stone is a hard one, progress is very slow; the rubbing must be done very gently. If the digestion is at all out of sorts, the destruction of the specimen is all but certain, and if a single grain of emery lingers about the whetstone, the thin and transparent section will inevitably be cut in two. Lately, I have fallen on a plan which has proved an almost perfect cure for impatience and ill nature, at this critical stage of the proceedings. It is this: Keep a dozen specimens advancing one after the other. When you have become tired

of one, lay it down and take up another. Strange as this may appear, it is quite a cure for impatience, and besides, more progress may be made with a dozen, than by working with one specimen only at a time.

I may say here that in making sections of flints, agates, and stones of like hardness, it is of no use rubbing them on the sandstone; they must be ground down from the very first on the iron plates with emery. The rest of the process is the same as has been described above.

I fancy that diamond-dust would be the disintegrator *par excellence*, but have never indulged in this luxury.

When the specimen is thin enough, and the beech can be well seen through it, I give it a few light rubs on the Water-of-Ayr stone, using water. The specimen can then be taken off the wood and mounted in Canada balsam, under a thin cover glass.

Remove with a wet cloth all the gum from the edge of the specimen, and thoroughly clean the wood of all impurity. Boil the kettle. Stick the blade of a pen-knife into the side of the beech, to act as a handle, and hold the specimen in the steam from the kettle-spout till it condescends to slide down the face of the wood. There need be no fear of its falling off. The water from the steam will prevent this. It may come off in less than five minutes, or it may take half an hour. Do not get impatient. To beguile the time, you may theorize about the size and number of the imaginary spaces that intervene between the molecules, or atoms, that build up the rock, and the size of the water molecules which are trying to find their way through these spaces in order to dissolve the gum arabic fixing the specimen to the wood. If the specimen take a long time to come off, you are very apt to conclude that the water "molecules" are too large to find their way through these spaces, and that they are laboriously "working their passage" underneath the specimen. Do not try to hasten the process by "nudging" the specimen with the edge of the knife-blade; this will only end in a vexatious smash. You must wait. After all, on an average, about a dozen specimens can be "steamed" from the wood and mounted in balsam, in about two hours. With every care, a specimen will sometimes break in two or more pieces, but you must just take advantage of this "multiplication by division," and make a slide of each fragment. The specimen having at last become loose on the

wood, you must heat a glass slide over an argand burner. Take a pen-knife, and with the blade, move the specimen gently to the edge of the wood. Put the knife-blade under the edge that projects beyond the wood; steady your hand on the side of the wood, do not attempt to lift the section, but draw it off the wood gently; the water from the condensed steam will keep it attached to the knife. Put a drop or two of warm balsam on the heated slide. Have ready a slide template covered with paper, having a circular hole cut in the middle of it, five-eighths of an inch in diameter, or the same size as the specimen. Put the template under the heated slide, holding both in the left hand.

Dry the free side of the specimen (still on the knife) over the argand lamp. Place the specimen gently on the balsam, directly over the hole in the template. Draw the knife off sideways. If you attempt to lift it up, the specimen will break in pieces, the water holds the section so firmly to the knife. Heat a three-quarter inch glass cover over the argand lamp, and put two drops of balsam on it. Lay it gently on the specimen, which by this time should be perfectly flat. Do not squeeze; heat the template, slide, and section over the lamp, and let the balsam gently boil, to expel the air-bubbles. Again, do not squeeze, but keep the object in position over the template with the point of the knife-blade. Allow the slide to cool a little. Now gently squeeze down the glass slip so as to expel all superfluous balsam.

The specimen is thus safely mounted and entirely free from air-bubbles and dirt. In this way I have made hundreds of transparent sections of traps, basalts, porphyrites, pitchstones, obsidians, granites, limestones, flints, agates, jaspers, fossil wood, teeth, corals, etc. This process is also suitable for making transparent sections bone, ivory, etc., and is much superior to the old method of rubbing down a specimen fixed with balsam to a glass slip. I have tried both methods. You may now enjoy the fruit of your labors, by examining the finished section under the microscope.

Many rock-sections show very fine natural colors, but the polariscope works wonders in giving splendid shades of colors and defining the crystalline structure of the igneous rocks; whilst on the other hand, many limestones, black-band ironstones, etc., are seen to be made up of myriads of minute fossil organic structures, closely compacted together in a "paste" of granular matter.

In selecting specimes of traps, limestones, etc., for sectionizing, too much care cannot be used in taking notes of the position, formation and locality from which each specimen is procured. When a specimen loses its "pedigree," it at the same time loses the greater part of its scientific interest and value.—*Journal of Postal Microscopical Society.*

On Mounting Diatoms, Etc., in Lines and Patterns.—Mr. H. Sharp gives the following directions for this kind of mounting, his slides thus prepared being said by Mr. W. H. Wooster to be "exquisite examples of manipulative skill":

Requisites.—(1) One or two cat's or mouse's whiskers fastened on match-like sticks or fine rushes, with shellac rather than gum, with about ¼ inch free. I prefer to have one with the natural point, and another with the point cut back to where it is somewhat stiffer. (2) A good simple microscope of some kind, either attached to a roomy stage-plate, with a mirror below and revolving-plate above, or detached on some stand, cut capable of being brought over a mounting-table with mirror and rotating plate as above. My own is home-made, extremely simple, costing nothing but the trouble, and such as any one with a little ingenuity could make for himself. It consists of a piece of pine 9 inches long, 5 inches wide, and 1 inch thick, on three legs, with a hole in the centre, into which a wooden match-box (with the bottom cut out) fits tightly, projecting a little above; over this fits a piece of slate just tight enough to rotate easily; beneath, a peg receives the mirror of the microscope. This forms the detached mounting-table. For the simple microscope, I take the foot and tube-pillar of the condenser, fit a piece of cane in this tube, drive a pickle-bottle cork stiffly on it, and fasten on this a horizontal wooden bar with a hole in the middle to fit on the cane, and another at each end in which to fit the lenses, which are just the 1½-inch and ½-inch objectives, which give far better definition than common pocket-lenses. (3) A steady hand. (4) Patience and perseverance.

Dry Mounts.—All diatoms and scales should be mounted on the cover, not the slide. Lay a clean cover on a slide and keep it in place by a drop of water between. As scales are larger than diatoms, it is well to begin with them. Put several on a slide in the ordinary way, pick out the ones wanted with a bristle under the

simple microscope, one at a time; keep the cover flooded with moisture from the breath, and deposit the scales picked up wherever wanted in lines or patterns. They will readily leave the bristle for the wet glass, and can be pushed about quite easily. When the moisture dries off, no stain is left, and the objects will adhere with sufficient firmness to resist anything short of a sharp jar. When the line or pattern is finished, mount in a shallow cement cell.

Balsam Mounts.—The cover must have a film of a gelatinous nature which is insoluble in balsam and its solvents. A thin aqueous solution of isinglass carefully filtered serves well. A single drop is placed on a clean cover, and spread out as thin as possible with a clean needle. It dries almost instantly in warm weather, and in a few seconds in winter. A diatom placed on this film and *gently breathed on* is securely sealed, and cannot be dislodged without moisture. Care must be taken to place the diatom in position while the film is quite dry; then breathe on it; allow the film to dry again; then place another diatom, and so on, till the line or pattern is finished. If any of the diatoms are thich or likely to be crushed, stick three bits of cover-glass under the edge of the cover with gum, and place a dot of gum on each before placing the cover in position on the slide. This, when dry, will keep the cover in its place while introducing the balsam, before doing which, allow a little benzine to run under by capillary attraction, which soon displaces the air from the diatoms. Then apply a little balsam to the edge of the cover and a bit of blotting-paper to the opposite edge. This draws away the benzine, and the balsam follows and takes its place. Another plan is to gum a piece of good cream-laid paper on the slide, centre on the turn-table, and make two cuts through the paper, removing the middle and outer portions and leaving a ring of paper to form a cell as large as the cover; then cut two small openings in opposite sides of the ring, gum the top of the cell and place the prepared cover on the gummed surface. When dry apply benzine to one of the small "sluice gates," and then balsam as before. Put the slide in a warm place for several days, and finish off with white, black, or colored varnish to fancy. Winter is the best time for dry mounts, as the breath dries off too soon in hot weather; and summer is the best time for the balsam mounts, as it is difficult in the winter to keep the breath from moistening the isinglass at the

wrong time. The cement-cells should be quite dry and hard before mounting, or a dewiness will appear and ruin the object. Soften the cement over the lamp, press the cover down till it sticks all round, let stand a day or two, and finish off. No doubt the diatoms would be more secure if burnt on the cover in the dry mounts, and possibly that process would be sufficient for the balsam mounts without the film of isinglass, as stated on p. 68 of Davies' Manual of Mounting.—*From the Journal of the Victoria Microscopical Society.*

The Relations of Micro-Organisms to Disease.—W. T. Belfield, M. D., in a lecture before the Alumni Association, College of Physicians and Surgeons, New York (*New York Medical Journal*, February 24 and March 3, 1883), says that he had chosen the subject simply because of its intrinsic interest and importance, and also because there existed in the mind of the medical public in this country a divided opinion regarding it, which seemed to him not to be warranted by the facts.

The study of micro-organisms is an excessively difficult one, owing to the need for the proper facilities in pursuing investigations in the laboratory, and the amount of time and expense required to carry on the work intelligently. There is a tendency for the profession to treat the subject as a trivial or fanciful one, and in general to ignore it. Bacteria have been observed as early as 1675, but they suddenly acquired an interest to pathologists in 1861, when Pasteur endeavored to show a genetic relation between plants and diseases.

Cohn's definition of bacteria, formulated in 1875, is still applicable, "Cells devoid of chlorophyll, spherical, oblong or cylindrical, which reproduce themselves extensively by transverse division, and live either isolated or in families." Nutrition and assimilation were carried on by a process of osmosis.

Their simplicity of organization explains their extensive distribution throughout nature.

Certain errors in manipulation and misinterpretations of facts, which were so liable to take place even with the greatest care and most improved facilities for investigation, would account for the serious mistake made by Pasteur and others in saying that bacteria were capable of spontaneous generation; there is no reason to suppose that bacteria, like all other organisms, do not always proceed

from pre-existing similar beings. The nomenclature, unfortunately, is much confused, each investigator naming according to his fancy. The French school, following Pasteur, make use of the terms vibrios, monads, torulaceæ, etc. Cohn's classification, according to Dr. Belfield, is probably the best; however, it needs some improvements. This nomenclature distinguishes the bacteria by form as micrococci, micro-bacteria, bacilli, spirilla.

The doctor thus defines bacterium: A mass of matter of definite shape and size, possessing or not possessing motion, of a certain chemical composition, having the power of growth and reproduction. No mass of matter can be said to be bacteria unless it possesses these qualities.

Even the mycologist cannot determine beyond doubt that a given object is one of the bacteria, except by cultivation outside of the body, thus demonstrating its reproductive power; but just here comes the practical hitch—many objects may come in contact with the particle under examination which might also contain bacteria. The doctor referred to cases showing how mistakes which had been made in the dissection had led to very erroneous conclusions.

The only means by which an organism in a culture can be shown to be the progeny of that first transplanted, is that it must be observed to proceed from it by continuity of structure: in order so to do we must directly observe it under the microscope. To do so, we must use a solid vehicle for the nutrition and cultivation of the organism. A solution of gelatin, beef extract, peptone, etc., is sterilized, and spread upon a disinfected slide, and allowed to dry; a heated needle is then dipped into the material containing the bacteria, and drawn lightly over the substance upon the slide, by which a scratch is made, to the edges of which the bacteria adhere; the slides are now to be placed in the incubator.

By this method we are able to know that the bacterium in the hundredth culture, for example, is structurally the same as the organism taken from the animal which had suffered from the disease in which the original bacterium was found.

Billroth asserts the presence of bacteria in perfectly healthy animals. Koch, Pasteur and Ehrlich have never so detected them.

Abnormal composition of the blood seemed to favor the development of some bacteria, after they had gained entrance to the

body, as abscesses in diabetic patients are swarming with micrococci.

The important and practical question is, to what extent the bacteria which are found in the tissues during certain morbid conditions are to be considered as the cause of the conditions with which they are associated.

In order to set this question at rest it must be demonstrated by culture of the bacteria found to exist in the diseased person, and the induction of the same disease in healthy animals by inoculation with a reproduction of the bacteria. The question to-day rests about as follows:

Diseases, the demonstration of the bacterial origin of which has been completed through inoculation with isolated bacteria by competent observers: anthrax.

Diseases, the bacterial origin of which has been affirmed after inoculation with isolated bacteria by one competent observer: tuberculosis.

Diseases which are always characterized by the presence of bacteria in the tissues, but which had not been induced by inoculation with isolated bacteria: pyæmia, diphtheria, erysipelas, etc.

Diseases in which after death bacteria have been found in the tissues: variola, scarlatina, typhoid fever, etc.

Diseases in which the presence of bacteria before and after death have been asserted: syphilis, typhus fever, intermittent fever measles, etc.

Bacillus Tuberculosis.—When we look at the past, and the present, the credulity of the medical profession appears somewhat strange. We constantly have new discoveries, which, if true, would work important changes in our practice; but they are frequently worthless, and after a short life, vanish as the dew in the morning sun. And we are constantly imposed upon by new remedies. It was only a few years since, we were taught that carbolic acid would cure almost any disease; and if it failed in curing the disease, a judicious application of it after death would suspend chemical action, and the body would show no tendency to decay. We have had specifics for cancer, specifics for phthisis pulmonalis, and specifics for other diseases, which were apparently well established by experiment and observation; but upon trial in our every-day practice, we

have been compelled to fall back on old principles and old remedies. Curing a cancer, where it had nearly destroyed a uterus, with chian turpentine; or phthisis with hypophosphites, where extensive tuberculosis existed, is something more gross and tangible; and are things in which we are not so liable to be mistaken as in minute microscropical examinations, where the rays of light that reach the eye are necessarily few.

The great discovery of Koch, of the "bacillus tuberculosis," appeared to show progress; but Dr. Schmidt, of New Orleans, would set us back where we stood years ago, and tell us what Koch discovered were no bacilli at all, but only fat-crystals. And there are other reasons, apart from Dr. Schmidt's experiments, to show that this is true.

According to Koch, it is in the earlier stages of tuberculosis that these "bacilli" appear most numerous; the very time at which the tissues are best supplied with fat. But when the disease has progressed, and the system almost succumbed to the influence of these organisms, they are frequently not found at all. They are absent when we would expect them in their greatest profusion. If consumption be caused by them, tubercle is their natural soil, and in its softened state, they would grow in their greatest luxuriance. If those objects be fat crystals, we would expect their disappearance as the disease progresses; if bacilli, we would expect their increase.

It is a settled point that many persons seeing, or thinking they saw, the same object, is not positive evidence of its existence. We were first told that those "bacilli" could only be seen after staining in a peculiar manner discovered by Koch. We are now told of various other modes of preparation; and that (although they were patiently searched after for years without being found) they may be seen without any particular preparation at all.

Baumgarten wishes to lay claim to this discovery, and proceeds to prepare the specimen in accordance with the supposed fact that the tubercle bacilli will remain absolutely colorless under a staining process, while the accompanying matter will take the coloring. Ehrlich takes the opposite position, and holds that the "bacilli" are not only readily stained, but that they hold it with such pertinacity, that they will not part with it in diluted nitric acid, while the other portions of the specimen will be bleached. Koch also claims

to be able to stain the "bacilli" by a process simple enough; but why should he use an aqueous solution of *vesuvin?* Vesuvin is the idocrase of mineralogy, a worthless crystalline stone, difficult to procure away from where it occurs in nature; and an aqueous solution of it would be about equal to an aqueous solution of quartz or of broken glass.

Since the discovery of Koch, nearly every person who has a microscope has been looking for those "bacilli," and have generally failed in seeing them, probably because they took their material from well-marked cases, where the fat had mostly disappeared. From such cases, with great care, we have prepared numerous slides, after Baumgarten and Ehrlich; but not having *vesuvin*, have not tried the process of Koch, and have been disappointed in seeing the "bacilli" in every instance. We have seen white lines, or "rods that sometimes branched," in specimens prepared after Baumgarten's process; but when viewed under a high power in a good light, the rods or lines become ragged and were resolved into white glass, which showed through minute flows or cracks in the desiccated sputa.—*Cin. Med. News.*

Search for "Atlantis" with the Microscope.—Under this heading Dr. A. Geikie reviews a paper by the Abbé Renard "On the Petrology of St. Paul's Rocks," an island nearly on the equator, and about 500 miles east of the South American coast:

"Are these rocks the last enduring remnant of 'Atlantis'—a continent that has otherwise disappeared, or are they portions of a volcanic mass like the other islands of the same ocean? To those who have not noted the modern progress of geological inquiry, it may seem incredible that any one should propose to solve this problem with the microscope. To seek for a supposed lost continent with the help of a microscope may seem to be as sane a proceeding as to attempt to revive the extinct *Ichthyosaurus* with a box of lucifer-matches. Yet in truth the answer to the question whether the St. Paul's Rocks are portions of a once more extensive land depends upon the ascertained origin of the materials of these rocks, and this origin can only be properly inferred from the detailed structure of the materials, as revealed by the microscope. The importance of microscopical examination in geological research, so urgently pressed upon the notice of geologists for some years past,

has sometimes been spoken of disparagingly, as if the conclusions to which it led were uncertain, and hardly worth the labor of arriving at them. We occasionally hear taunts levelled at the 'waistcoat-pocket geologists,' who carry home little chips of rock, slice them, look at them with their microscopes, and straightway reveal to their admiring friends the true structure and history of a whole mountain range or region. That the sarcasm is often well deserved must be frankly conceded. Some observers with the microscope have been so captivated with their new toy as to persuade themselves that with its aid they may dispense with the old-fashioned methods of observation in the field. But there could not be a more fatal mistake. The fundamental questions of geological structure must be determined on the ground. The microscope becomes an invaluable help in widening and correcting the insight so obtained; but its verdict is sometimes as ambiguous as that of any oracle. In any case it must remain the servant, not the master, of the field-geologist."

M. Renard has undertaken a most elaborate investigation (chemically and microscopically) of sections of the rocks brought home by the "Challenger," with the view of determining whether they were to be considered as volcanic or to be classed among the crystalline schists. If they belong to the latter, they must once have lain deeply buried beneath overlying masses, by the removal of which they have been revealed. They would thus go far to prove the former existence of much higher and more extensive land in that region of the Atlantic; land, too, not formed of mere volcanic protrusions, but built up of solid rock-masses, such as compose the framework of the continents. If, on the other hand, the rock is volcanic, then the islets of St. Paul belong to the same order as the oceanic islands all over the globe. The Abbé inclines on the whole to the side of the crystalline schists, but Professor Geikie considers that the balance of proof is decidedly in favor of the volcanic origin of the rock.—*Royal Medical Journal.*

Green Bearded Oysters.—For some time past it has been reported that the oysters taken from the Shrewsbury River beds were diseased and afflicted with what is known as "green gill." Mr. Eugene Blackford, one of the New York Fish Commissioners, has

had specimens of these oysters examined under the microscope by Prof. H. J. Rice, of this city, with the following result:

He found that the digestive organs of the oysters were filled with minute fragments of marine plants, or algæ. The presence of this substance gave the mouth or beard of the oyster a greenish hue. The body of the bivalve was of a natural color. It has been feared that this peculiar appearance was due to the contact of the oyster with copper in some form, but the experiment showed that this could not be the case. In Europe green oysters are very common, and careful experiments have been made there by Professor Sullivan to discover the cause. He analyzed the mud from which they were taken, but did not find any indications of the presence of a metallic substance. He then placed some oysters in a solution of copper and found that they readily assimilated it. Its presence was detected by the body assuming a bluish-green appearance, while the beard remained of its natural color. When the oysters were fed on algæ, the beards gradually turned green without the rest of the body being affected.

On being provided with their natural food, which principally consists of microscopical organisms known as diatoms, the mantle returned to its ordinary color.

Mr. Blackford states that he had noticed the same thing in oysters coming from Virginia, and also that some taken from the vicinity of Staten Island were likewise affected, but that it was principally confined to the Shrewsburies.

The greenish tint has caused much prejudice against such oysters, but there does not seem to exist the slightest ground for it. The green gill is not, according to the expert's report, the symptom of any disease; in fact, oysters seem to thrive that feed on algæ, which produces the objectionable color.

Mr. Blackford has made arrangements with Prof. Rice to examine daily the fish received at the Fulton Market, in this city, for the period of one year from the first of next June, and we look forward to some important discoveries as the outcome of these investigations. In the examinations the viscera of the fish will be removed and carefully dissected; the size, weight, time, and place of capture will also be noted. The mint and roe will be removed as well as the contents of the stomach, all of

which will be subjected to the most careful microscopic examination.

Owing to much conflicting testimony as to the habits of the bluefish, striped bass, and other salt water fishes, satisfactory laws have not been passed for their protection, but Mr. Blackford expects that his investigations will result in establishing many facts in regard to the habits of our sea fishes which heretofore have not been known.

Malignant Measles—Micrococcus in the Blood.—We abstract the following from a paper read before the College of Physicians of Philadelphia, by John M. Keating, M. D., Lecturer on Diseases of Children in the University of Pennsylvania, Visiting Obstetrician to the Philadelphia Hospital:

The conclusions which seem warranted by the statements of this paper, and by the observations made in other cases in the hospital, are as follows:

The micrococcus is found in the contents of pustules and vesicles, and also in the blood taken from the measles-papule in ordinary mild cases, without its being present in the blood taken from the punctured finger.

The moment that symptoms of malignancy—viz., dark eruptions, feebly-defined crescents, delayed and imperfect appearance of the eruption, with feeble circulation, high temperature and pharyngeal false membrane—appeared, the examination of the blood showed micrococci in abundance in the field.

In cases of rapid sthenic disease with high temperature and great tissue change, the evidences of large quantities of fibrin with a tendency to coagulation are manifest. The rapid production of micrococci soon gives the mechanical impediment, and if stasis takes place from any other obstruction to the circulation, clots rapidly form.

The non-appearance of clots in malignant fevers attended with fluid blood, such as low forms of typhus, diphtheria, etc., is simply due to the fact that rapid tissue-changes have resulted in decomposition, instead of into fibrin-forming substances—no fibrin is formed, hence no clots—but the micrococci are present all the same. These cases are held by some to be the malignant ones, but I think

the *foudroyante* character of the others, just mentioned, entitles them to be placed in the same category.

But the micrococcus, if left unheeded, may attack the white corpuscle as distinctly seen under the microscope, and destroy its contents. The red cells also change in appearance, and finally probably become, to all intents and purposes, useless in the economy. When such a condition is seen by the microscope, and found extensive, a fatal prognosis can be given, despite the most active treatment.

In cases where the white blood-cells are as yet unaffected, treatment, when active, will be followed by good results, provided the other complications, as visceral inflammation, etc., are not in themselves excessive.

Alcohol (whisky in our cases) seems in some way, when given in large amounts, to check the progress of the marauders, to arrest the process of destruction, and, if needful, can be associated with quinine and iron in small repeated doses, digitalis perhaps, and frictions, baths and poultices, etc. As we have seen, the symptoms presented are contemporary with the changes going on within the blood; they may, in lieu of a careful microscopic examination of the blood, be taken as a gauge for treatment; knowing what can and will take place, early active treatment will give the patient some chance for the future.—*Medical Times.*

The Tongue Under the Microscope.—The examination of the tongue in sickness is universally resorted to, and its diagnostic importance often supersedes that of even the pulse. In the late war, while on duty at Exchange Barracks in Nashville, Tenn., I may venture to say of many thousands of disabled soldiers, I examined nearly every man's tongue, and the pulse hardly oftener, perhaps, than one in a hundred. As this diagnostic labor tallied with subsequent examinations at the respective hospitals, to which the soldiers were assigned, I could hardly be charged with any omission of duty, at least, I do not remember that my diagnosis ever differed much with the subsequent examination of others. I state this to show the importance of the examination of the tongue as a factor in making a diagnosis. It oftener reveals prints of disease we can not learn from any other source.

More recently I have been led to make microscopic examina-

tions of the tongue. With some, while no difference could be seen with the naked eye, under the glass, no two tongues could be considered to look precisely alike. These micro-lingual examinations I have made with healthy children whose constitutional and hereditary peculiarities I was well acquainted with, and the tongue not only betrayed, in some of them, latent disease, but cachexia itself.

I need not enter into the pathological relations of the tongue. I believe that could be studied with great advantage under the magnifying glass, and I would respectfully ask the attention of the profession to the subject, and will be pleased to receive reports on the result of their observation for material which I hope in the future to utilize in a treatise on this subject. Any help received in this matter will be duly accredited. Authenticity would be derived from the investigations of many that could not be looked for from the researches prosecuted by one.

The tongue in the healthy subject should receive first by the aid of the glass most careful study. The examination of the healthy tongue should be made several times in the course of twenty-four hours, for the investigator will find constant changes, as induced by sleep, sleeplessness, thirst, hunger, fatigue, rest, eating, digestion, indigestion, cold and heat, etc., all having a tendency to vary its physiological expression.

And, in disease, is there not an error prevalent of limiting too much the pathological signs read from the tongue to diseases of the liver and alimentary canal? A lesion of the air passages may influence the tongue as readily as some disease of the stomach. The tongue is as much the terminus of the respiratory organs as of the alimentary canal, and is the subject of reflex influences as much in one as in the other.—*Cincinnati Med. News.*

Food Adulteration in Paris.—An article in a medical exchange calls attention to the extensive prevalence of adulteration in Paris. It appears that almost all articles used for food, including condiments, are so extensively sophisticated that it is very difficult to obtain anything which is really pure.

"Out of thirty-nine specimens of syrup, twenty-four had been artificially colored, and were not, therefore, made from the fruits which they were named after, while nine were composed of substances deleterious to health. It is even worse with jams, for out of

eighteen specimens, fourteen were made principally from glucose, while much of the red current jelly sold in Paris is made without currants, the jelly being obtained by the use of sea-weed, the color with fuchine, and the flavor with an essence made from acetic, tartaric, and other acids. Even bread, the consumption of which in France is estimated at sixteen thousand tons a day, is very much adulterated in Paris by dampening the flour so as to increase its weight, mixing it with bean-meal, potato starch, etc., or adding to it deleterious compounds of lead, copper, zinc, sulphate of lime, and chalk. Out of thirty-one specimens of bread analyzed, only thirteen were made of pure wheat flour; and in examining the composition of flour, the spectrum analysis has been found of great assistance as the presence of chemical components can be detected at once. Butter is even more generally adulterated than bread; for out of sixty-two samples only eleven were pure. When one remembers that the margarine manufactured in New York is equivalent to the quantity of butter which could be made from the milk of three hundred thousand cows, and that whole ship-loads of it are exported from Holland to Normandy, and send thence to Paris as "best Normandy butter, it will be easy to understand why the report of the analysis is so unfavorable."—*Herald of Health.*

Dr. Schmidt and the Tubercle Bacillus.—Dr. H. D. Schmidt, a pathologist of New Orleans, has recently appeared in an article in the Chicago *Medical Journal and Examiner* in which he strongly combats the views of Koch on the tubercle bacillus. Dr. Schmidt's qualification having been vouched for by respectable authority, his article is being regarded by some of our exchanges as an overthrow of the theory which has won fame for Koch. The pathologist on the staff of the *Maryland Medical Journal*, Dr. Councilman, is, however, not one of those who have been carried away by Dr. Schmidt's charge, and in his issue of the 1st instant he undertakes to show that the New Orleans pathologist is an incompetent. He pronounces the article in question "so full of microscopic impossibilities that were it not for the fact that such statements as his were calculated to do harm to a few members of the profession who had not time or opportunity to acquaint themselves with the rudiments of modern microscopic research in lower organisms," he should not notice it. Dr. Schmidt having declared

that Koch's bacilli are nothing more than margaric acid crystals, Dr. C. says there is as much difference between these crystals and the bacilli as there is between a tree and an iron lamp post. After indulging in various other such little pleasantries at Dr. S.'s expense, Dr. C. closes his criticism with the following sentiment: "We would earnestly recommend the author of this valuable contribution to medical science to read a few of the articles in bacteria literature that have lately appeared; that of Koch in the *Mittheilungen* or some of Weigert's articles in Virchow's *Archivs*, then to commence his studies with the micrococci and other simple forms, studying the characteristics of each as he goes along; then to try and get some of the tissue from anthrax and study the bacilli there, and gradually approach the higher and more difficult fields of microscopic art. If he will do this, we feel quite sure that in a short time he will gladly retire from circulation such copies of the December number of the Chicago *Medical Journal* as he can get his hands on."—*Medical Age.*

Vaccination in Malignant Charbon.—When the results obtained by M. Pasteur through the inoculation of the attenuated virus of malignant charbon were published, it was considered a scientific experiment, and but few thought that any practical benefit would accrue therefrom. The report recently presented to the veterinary society of the department of Eure-et-Loire, show that these vaccinations, practiced on a large scale, have given unexpected results. The number of sheep vaccinated in this department was 79,312; the annual loss of these flocks amounted to 7,237 animals, or about 9 per cent.; since vaccination but 518 animals have perished, or about $\frac{65}{100}$ of 1 per cent.

It is true that the general mortality from charbon among the sheep in the department was lower than usual (about 3 per cent.), so that the loss among these 79,312 sheep would have been 2,382 instead of 518 after vaccination.

In flocks partly protected, the mortality among 2,308 vaccinated animals was 8, or $\frac{4}{10}$ of 1 per cent.; and among 1,659 non-vaccinated, 60, or $3\frac{3}{10}$ per cent. In these flocks the vaccinated and unvaccinated were under exactly similar conditions as regarded food, stable, temperature, etc.

The veterinary surgeons vaccinated 4,652 cattle, among which

the annual loss from charbon was 322 animals; since vaccination but 11 cows were lost, showing a reduction in the annual mortality from $7\frac{3}{10}$ per cent. to $\frac{24}{100}$ of 1 per cent.

As the mortality from charbon among horses was light, and vaccination induced grandular enlargements, the operation was not undertaken on a grand scale.

Simple Method of Embedding Small Bodies.—In every treatise on microscopical manipulation there are given directions for embedding for section cutting, but the writer has devised a method for small bodies which possesses several advantages. The *modus operandi* is as follows: The substance to be embedded is hardened after any of the usual methods and placed, from alcohol into turpentine and then transferred to a saturated solution of paraffine in turpentine, the same as in all methods of paraffine embedding. Here is where the novelty comes in. The specimen is removed from the mixture and the superfluous fluid removed by means of blotting paper and then placed on the end of a cylinder of paraffine (or paraffine and vaseline). A bit of stout iron wire is now heated in the flame of a spirit lamp, and with it a hole is melted in the end of the cylinder, and the specimen then pushed into the melted paraffine and placed in any desired position. The advantages of the method are: the quickness with which it may be performed, for from the time when the operation is begun until sections can be cut is not over three minutes, while the melting of so small an amount of paraffine prevents any injury to tissues by overheating. In embedding solid bodies, a slight variation sometimes results in the saving of more time. The specimen may be embedded directly from alcohol without the intervening turpentine, and then when the section is cut it readily separates from the shaving of paraffine without the use of turpentine to dissolve it. This, of course, applies to solid bodies without cavities or irregular outline.—*Scientific and Literary Gossip.*

Items.

A school of pharmacy for women has been opened at Louisville, Ky. It is the only school in the world especially designed for the advancement of women in pharmaceutical learning.—*Ex.*

Dr. C. O. Whitman is to have charge of the Department of Microscopy in the *American Naturalist* in the future. This indicates that that portion of the magazine will have a highly scientific character.

Dr. Thomas F. Lucy read a very interesting paper before the Elmira Microscopical Society on "Microscopy and Botany." We would like to reproduce the whole paper, but we do not have the space at our command.

"Cohn estimates that one bacterial rod, under favorable circumstances, will produce 281,500,000,000 in forty-eight hours; and that, were it not for the unfavorable circumstances incident to its situation, it would fill the ocean in five days."—*Popular Science Monthly.*

At a meeting of the American Dermatological Society Dr. E. W. Robinson, in a paper on "The Nerves of the Skin," stated that nerves do not end in free ends, but in loops, and then return into the superficial or deep plexuses, or into a neighboring papilla of the skin.—*Ex.*

"Away then," said Prof. Parish to the 35 young women to whom he was giving diplomas as graduates of the Philadelphia Woman's Medical College, "with the fallacious reasoning that a woman may with propriety devote her capabilities to the study of the lily or the rose, the spider or the beetle, but cannot study man, the noblest work of God."—*Ex.*

"Microscopical Diagnosis" has received the best of treatment from the press, and a large number of copies have been sold. Baron Ferd. von Mueller, of Sidney, Australia, says: I am quite touched with your kindness, dear Mr. Davis, in sending me a copy of Dr. Stowell's excellent "Microscopical Diagnosis." The book is doubly interesting through the co-authorship of a lady.

Dr. Formad, of Philadelphia, has produced epithelioma in dogs by incising the skin and keeping up the irritation with a

weak croton oil—croton oil mixed with glycerine. It is said that under the microscope this artificial product does not vary from the epithelioma in man. He also produced sarcoma in the bones of dogs by fracturing them and keeping up irritation by motion.—*Ex.*

To Mount in Glycerine.—Heat India-rubber till it becomes sticky, dissolve it in benzol, ring both cover and slide, then let it remain till tacky; arrange the object in glycerine, press down the cover, wash away spare glycerine, and run asphalte varnish or other finish. "The advantages are, the India-rubber sticks in spite of the glycerine, and is elastic, and so a great amount of trouble is saved." —*Journ. Post. Mic. Soc.*

To Mount Plants in Glycerine and Water.—Add to the glycerine a few drops of carbolic acid to guard against fungoid growth—mix with equal parts of water—don't cement the cover-glass down, but let the water evaporate, and add more glycerine and water until the plant gets gradually filled with glycerine. Fasten the cover-glass by first ringing it with gelatine, to which any cement will adhere.—*Journ. Post. Mic. Soc.*

Mr. James Smith said that, in working with high powers under the binocular, he had always found it of great advantage to use a finely-ground glass slip under the slide on which the object was mounted. If a 1-4th in. or a 1-8th in. were used under ordinary circumstances, the black division across the field was seen, but the ground glass seemed to obliterate this entirely. He generally used a piece of very pale blue glass, ground on the upper surface.—*Royal Mic. Soc. Proc.*

Mr. Beck says we are only as yet in the infancy of the binocular microscope, and he looked forward to the time when much more attention would be paid to its construction, and particularly to the question of ascertaining the best point at which the prism should be placed to get the full field without adventitious aid in the way of illuminators, by which improved results would no doubt be obtained. He believed that the binocular was the microscope which would be used in the future.—*Ex.*

Fatty Bodies as Generators of Bacteria.—T. Brisson de Lenharée points out that fatty substances on mineral bodies or used

in the hair, such as oil, pomade, glycerin, etc., attract the numerous minute germs, especially those of parasitic fungi, which abound in the air; glycerine, however, is not so deleterious in this way as the other substances named. Hence a very common source of baldness. Building and funereal stones which had been soaked in oil in order to protect inscriptions on them from the influence of the weather were found to have been much attacked by minute fungi from the very means used to protect them.—*Ex.*

Carriage of Schizomycetes through the Air.—C. v. Nägeli and H. Buchner have determined that bacteria and similar organisms are not taken up into the air simply by evaporation of the fluids in which they live, nor are they detached from a solid substratum by currents of dry air only. In order for the germs to be dispersed through the air, they must be scattered by drops of water, and are then taken up by currents of air. This view is of importance in connection with the spread of malarial fevers.—*Royal Mic. Journal.*

Hunt's American Cement.—Mr. J. Ford has received from an American correspondent the following recipe for making the cement, so effectually used by professional mounters, and which has been regarded as a trade secret: "Take some zinc white as sold for painters' use, drain off the oil, and mix with Canada balsam, dissolved very thin with chloroform. If it does not flow freely from the brush, add a little turpentine. The mixture should be about the thickness of cream, and kept in a bottle with a glass cap." Mr. F. J. Allen adds: "Having sealed the slide with the cement, paint on it with artists' oil-colors, thinned if necessary, with turpentine, and when dry varnish it with very dilute balsam to give it a gloss."—*Journal Postal Mic. Society.*

Inoculation of Tuberculosis through Respiration.—In order to ascertain whether the germs of tuberculosis, if present in the air, can be inhaled by respiration, Giboux prepared two boxes, in each of which he placed two young rabbits, and passed daily through each of them 20,000–25,000 c.c. of air, which had been exhaled by phthisical patients of the second and third degree. With one of the boxes the air was first filtered through a wad of cotton-wool. After about three and a half months, the rabbits in the unprotected box died, having suffered loss of appetite, thirst,

diarrhœa, etc., and the lungs, liver, and spleen were found to be tuberculated. In the protected box, on the contrary, the rabbits were still perfectly healthy, and on autopsy not a trace of tuberculosis was to be found.—*Comptes Rendus.*

Prussian Blue and Safrane for Plant Sections.—Prof. J. Brun refers to the process of double staining for vegetable histology described by him to the Geneva Physical and Natural History Society, in which the action of Prussian blue alternates with that of safranine. The process is to be recommended for the clearness with which the preparations show all the minutest details, even in the interior of the cells. The chlorophyll retains its color, while the cellulose, the layers of the cell-walls and their contents, the incrusting matter, and the fatty or resinous substances are, on the contrary, differently colored and readily differentiated. He insists on the value of these histo-chemical processes in distinguishing very minute transparent bodies, and above all to differentiate organs scattered through opaline liquids or colorless histological elements. —*Journal de Mic.*

Objectives of Large Aperture.—Dr. J. Pelletan criticizes Dr. Carpenter's remarks on this subject at Montreal, and in regard to injury to the eyesight suggested as the result of the use of a $\frac{4}{10}$ in. of large aperture, considers it an "accusation as well founded as to say that too large a hat will produce corns on the feet." If it is the fact that certain objectives may injure the sight it is the high powers with small angle, deficient in light, resolving badly, and requiring "efforts of vision," so to say, rather than the relatively low powers of large angle, bright, and showing at once the image of the object clearly resolved. He also claims as conclusive evidence in favor of the necessity of objectives of the largest aperture the admission of Dr. Carpenter that the flagella of *Bacterium termo* could not have been discovered without such objectives. The ½ in. of 40° could not be of any use to a microscopist for delicate and serious observations, neither to the diatomist nor to the investigator of the histological elements who requires a large aperture to enable him to follow a fibril layer by layer so as to determine all the relations of its position and the precise point where it ends.—*Royal Mic. Journal.*

Reticulated Structure of Living Matter.—At a recent

meeting of the New York Academy of Sciences, Mr. Romeyn Hitchcock read a paper on the above subject on the "Bioplasm Doctrine."

The speaker devoted most of his paper to objections to Heitzmann and Elsberg's claim of having discovered a reticulum or network in red and white corpuscles and in the amœba. He said that if these microscopists had seen it, others ought to be able to see it also. Few people, it is true, know how to *use* a microscope, but most people can see the most minute objects under a high power glass when it has been properly adjusted and focused, hence he denied Heitzmann's assertion that because a tryo can't see a thing is no proof that it don't exist.

The speaker had several elegant microscopes on the table fitted with the best high power objectives, and under one of these he placed an amœba, under another a pus corpuscle, and under two others red blood corpuscles, to demonstrate the fact that no *reticulum* or network exists, because none can be seen. It has been claimed that this reticulum contracts and expands, thus causing motion, and that some such reticulation is necessary to account for the motions of protoplasm, but it may be asked how this can of itself contract and expand. It is an explanation which fails to explain. The speaker next referred to the three sources of error in microscopic work: First, error in illumination; second, error in the correction of objectives; third, errors in focusing. To demonstrate the reticulum on red blood corpuscles, it is necessary to touch them with a dilute solution of bichromate of potassium, but this causes them to become granular, and as this action continues, it breaks up the corpuscles. Such an effect was visible in one of the slides exhibited under the microscope. It is claimed that reticulum can be seen in the white corpuscles without this treatment, but such was not the case here. Minute granules can be seen in amœba, but no reticulum. In microscopy errors of interpretation are easily made; dots may merge into each other and be taken for lines, and such may have been the case in the amœba.—*Scientific American.*

Reviews.

THE PHYSICIAN HIMSELF AND WHAT HE SHOULD ADD TO HIS SCIENTIFIC ACQUIREMENTS. By D. W. Cathell, M. D., Baltimore, Md. Third edition, revised. Cushings & Bailey, Publishers, Baltimore. Price, $1.25.

Two large editions of 6,000 copies have been exhausted in a remarkably short time, and the third edition is before us. We are now sure that six thousand medical men are wiser than they were two years ago. How it must make some of the old fogies squirm to read such a live, modern book! We hope Dr. Cathell will live to see at least sixty thousand copies of his book sold, one copy to each physician in the United States.

ALUMNI ADDRESS. By Rev. M. S. Hard, Elmira, N. Y., President of the Alumni Association of Syracuse University.

The address is written in Mr. Hard's happiest style, and is filled with rare aphorisms. His addresses are always short but full of deep interest. His sentences are concise but of intense meaning and breadth of thought.

"The knowledge a man is forced to gain, he receives no credit for acquiring."

"Trusteeship is only representation, it does not indicate ownership."

"Money is badly, when ignorantly given."

"Simply to use a thing, for what you can get out of it, breeds no love."

"A wealthy minister is sought by managers of every menagerie."

"THE CENTURY." April, 1883. Union Square, New York City.

The April number of this welcome visitor is unusually replete with good things. "The Capitol at Washington" is superbly illustrated and will be perused with interest. The engravings are numerous and very fine. We note especially the one "At Sea," drawn with the graver by Kingsley. Each number of "The Century" seems perfect, yet the one to follow will always be better.

THE AMERICAN JOURNAL OF PHYSIOLOGY.

This journal started some six months ago and it now looks as if it had come to stay. Prominent men have promised to give it their support and we wish everybody would endorse it by sending $1.50 to the editor, D. H. Fernandes, M. D., Indianapolis, Ind.

HAND BOOK OF INVERTEBRATE ZOOLOGY FOR LABORATORIES AND SEASIDE WORK. By W. K. Brooks, Ph. D., Associate in Biology and Director of the Chesapeake Zoological Laboratory of the Johns Hopkins University. Published by S. E. Cassino, Boston.

The work is a hand-book for beginners and its fascinating style will captivate any beginner or expert who is fortunate enough to have the book for reference. The illustrations form a leading feature of the work and many of them are really beautiful, though some are too diagramatic to be pronounced "works of art." The simplest one, however, expresses clearly all the author desires to have illustrated. S. E. Cassino has produced a handsome volume of 400 pages, 8vo.

JOURNAL OF THE POSTAL MICROSCOPICAL SOCIETY. Vol. I. Bound. Edited by Alfred Allen, Hon. Secretary. Printed by W. P. Collins, 157 Great Portland street, London.

In September, 1873, a company of thirty-six gentlemen decided to organize a club for the purpose of circulating microscopical slides. They were governed by only a few simple rules, and adopted the name of the "Postal Micro-Cabinet Club." In a short time the club had increased to over one hundred members, and they changed the name to the "Postal Microscopical Society." In March, 1882, the society having grown to such dimensions and wealth, they decided from the abundance of their means to start a microscopical journal, as the organ of their society. This publication has proved a successful venture, and is a fine addition to microscopical literature. It is replete with valuable help to every scientific investigator.

This journal is very much like THE MICROSCOPE in one particular, at least: It is filled with practical matter. It should have many readers in this country. Should any of our subscribers desire a copy, they can get it by sending one shilling and sixpence to the printer.

REPORT OF THE BOARD OF TRUSTEES OF THE EASTERN MICHIGAN ASYLUM at Pontiac, for the Biennial Period Ending September 30, 1882. Printed by W. S. George & Co., Lansing, Mich.

PROCEEDINGS OF THE CALIFORNIA PHARMACEUTICAL SOCIETY AND COLLEGE of Pharmacy. Report of the fourteenth annual meeting. Held at San Francisco, January 11, 1883. Together with the eleventh annual lecture announcement, regulations of the board of trustees, etc. Compliments of E. W. Rumyon, Professor of Pharmacy in the California College of Pharmacy.

An exceedingly neat pamphlet of ninety-six pages.

ADDRESSES DELIVERED ON THE OCCASION OF THE DEDICATION OF COOPER Medical College Building. By Levi C. Lane, A. M., M. D., Professor of Surgery, and Member of the Royal College of Surgeons, London; and by Edward R. Taylor.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

FOR SALE.—One copy of Leidy's Rhizopods of North America. Price, $7.50. Address, C. H. STOWELL, Ann Arbor, Mich.

FOR SALE.—Mounts of renal tube casts and double-stained blood corpuscles. $1.00 per slide. A. Y. MOORE, 53 Prospect St., Cleveland, Ohio.

WILL exchange rubber cement for good slides. EUGENE PINCKNEY, Dixon, Ill.

FOR SALE.—Zentmeyer's American Grand with Accessories. Cost $500. Sold at a bargain. STEPHEN BOWERS, Falls City, Neb.

WILL exchange histological mounts for equally good slides. FRED. K, SMITH, Ann Arbor, Mich.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

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Original Communications.

AMPHIPLEURA PELLUCIDA BY CENTRAL LIGHT.

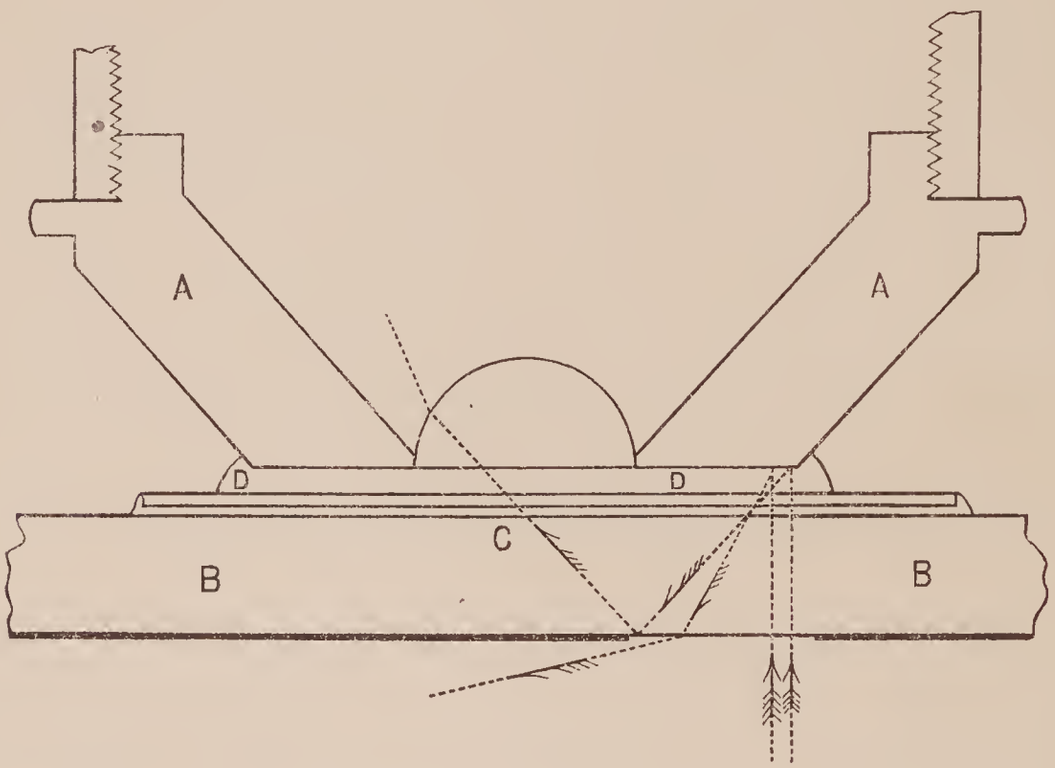
BY A. Y. MOORE, M. D.

FROM an article by Mr. B. W. Thomas, in the last issue of this journal, it would appear that the resolution of *Am. Pellucida* had actually been accomplished; but I think that such a feat is very far beyond the capabilities of any objective yet made, and that we shall have to wait some time before lenses will be sufficiently improved to do such a thing. In the article referred to, it is stated that I claimed to have resolved this diatom by central light a year ago, but I simply claimed to have done so with the mirror central, well knowing at the time that the light entered the objective very obliquely, as may be seen by referring to back numbers of this journal.

There are two ways of determining that the light is *not* central: first, by looking down the tube into the objective, and secondly, by the color of the image—in fact, by the chromatic correction of the

objective. If the resolution were done by central light, the light would be seen through the center of the back lens, by looking down the tube; while if oblique light were the cause of it, the light would be seen through the edge of it.

It is well known that an objective which is properly corrected (chromatically) by oblique light, with any given immersion fluid, will be decidedly undercorrected by central light; and if properly corrected by central light, it will be overcorrected by oblique light. Thus it can be determined whether the resolution is accomplished by central or oblique light; and I think that if Prof. Forbes and Dr. Detmers had noticed the correction they would have found that it indicated central light.



But the question arises: If the resolution be by oblique light, how does the light enter the objective, when the mirror is central? That Dr. Detmers is wrong in supposing the homogeneous fluid to act as a lens and thereby illuminate the object, I think will be evident to any one who will carefully try the experiment. And in the solution given by Prof. Forbes, viz., that of the reflections between the top and bottom of the slide, I think it would be found that insufficient light would be the result.

The real explanation is this: The light from the mirror (central) is condensed on the edge of the front cell of the objective.

This, being an imperfect polish, radiates the light as if it were self-luminous. Now, all light reaching the bottom of the slide at a greater incidence than the critical angle will be reflected upwards. This goes in all directions and such as may go towards the lens will, to some extent at least, enter, after having passed through the diatom.

This is shown in the diagram where *a* represents the front of the objective, *b* the slide and cover, (balsam mount, of course, and hence regarded as one substance), *c* the object and *d* the homogeneous fluid. The dotted lines show the course of the light, going in the directions indicated by the arrows.

So it will be seen that so far from being central light, it is only light in excess of the numerical value 1.00 that really does the work. That the light really takes the course I have pointed out I have proved by painting the lower surface of the slide with India ink as shown by the heavy lines in the diagram. Then the only course left is that described.

I think Mr. Edward Bausch was the first to resolve *Am. pel.* by this method, and since then it has been done by several persons and by various objectives. All that is necessary, so far as the objective is concerned, is that it be capable of resolving it by oblique sunlight and have a sufficiently broad front to radiate the light.

PROJECTING LANTERNS.

BY C. H. STOWELL.

A GOOD deal has been said of late about projecting lanterns, and some new styles have been brought forward for public favor. One inventor has a lantern that "will actually show the circulation of the blood in the frog on a disk four feet in diameter." So much has been said that no apology is necessary if I describe my own lantern and what it will do.

After experimenting for over two years, I purchased a Marcy's lime light sciopticon about five years ago. One of Zentmayer's microscopic attachments was ordered at the same time. Two cylinders, filled with oxygen and hydrogen, respectively, were purchased from New York. For objectives I have used those from my microscope with success, although the field is flatter and lighter if objectives be used that were made especially for this work. Zent-

mayer makes good lenses of this kind; so do Bausch and Lomb. An one-and-one-half inch of Zentmayer's and a three-fourths of Bausch and Lomb make a good outfit. To work nicely the gases should be under heavy pressure. When the pressure in the cylinders is down to 60 or 70 pounds, I do not have such good results. In that condition they are generally sent to Detroit—only 40 miles distant—and filled to 200 pounds pressure.

With this simple outfit I illustrate my lectures on Histology. A transverse section of the spinal cord of a pig can be enlarged to ten feet in diameter on the screen. To show the nerve-cells a power of 500 diameters is easily obtained. The cells will show so clearly that their poles can be counted and their nuclei clearly discerned. Sections of injected kidney, liver, intestine, etc., show very clearly and beautifully as well. Sections of cancer will show the stroma and cells. Pneumonia lung will show air cells six inches in diameter more or less filled with the exudate.

One of Dr. A. Y. Moore's double-stained blood slides will show the individual corpuscles and their nuclei at a distance of 20 feet from the screen very clearly. This is true with a disk six feet in diameter. The striæ and sarcolemma of muscle can be exhibited also. The circulation of the blood is simply no trick at all. I have exhibited this, using the tongue of the frog, on a disk 12 feet in diameter.

By a simple device opaque specimens are thrown upon the screen. In this way a frog is pithed, the thoracic walls removed, and the heart beating *in situ* exhibited. The heart will appear about a foot in length and will powerfully contract, stimulated by the heat of the light. The heart may be removed from the body, pinned to a card and this thrown on the screen, still there is vigorous motion.

Again the heart may be halved and quartered, yet still the pieces will be seen to contract. No complex or wonderful apparatus required. Two hundred dollars and a little patience and ingenuity will go farther than some fifteen hundred dollar outfits.

The following is clipped from last year's report of the Michigan State Medical Society, held at Ypsilanti:

"Dr. C. H. Stowell, Professor of Histology and Microscopy in the University, was then introduced. He gave an exhibition with the lime-light sciopticon with microscopic attachment, throwing

upon a large screen microscopic sections of the various tissues and organs of the body, magnified over 500 diameters. The doctor demonstrated his method of teaching histology in the lecture room, and showed conclusively that with these appliances a lecture on histology could be made interesting as well as instructive. Some of the pathological specimens exhibited showed very find indeed; notably the sections of lung in pneumonia, phthisis, and emphysemia, also the lesions in the cord in locomotor ataxia. The exhibition was a convincing proof to all of the value of that mode of teaching and demonstrating the healthy and diseased tissues of the body."

[Abstracted for THE MICROSCOPE by Geo. A. Hendricks, Instructor in Anatomy, University of Michigan.]

ABSTRACTS.

BACILLI IN THE SPUTUM OF PHTHISIS.—Dr. Pfeiffer (*Berlin Klin. Woch.*) has instituted researches into the character and regularity of appearance of bacilli in the expectoration of consumptive patients. He finds that in proportion to the mildness or severity of the affection is the abundance or sparseness of the bacilli in the sputum. A suspected expectoration requires to be examined for several days in succession under high powers of the microscope before a conclusion can be arrived at. An alkaline solution is used to dissolve the sputa, while the bacilli is detected by gentianette or Bismarck brown dyes.—*British Medical Journal.*

HOW TO FIX ANILINE DYES.—From a paper on Practical Pathological Work, by H. A. Reevis, F. R. C. S. E., the following on treble staining, is taken. All working histologists will be thankful for the discovery of a simple and effectual mode of setting the various beautiful aniline colors which have been much used of late years, but which do not stand the immersion in spirit and alcohol necessary to prepare them for mounting in Canada balsam, dammar or turpentine. Sections of fresh tissues or of those hardened in alcohol, Müller's fluid, chromic acid or chromic and spirit mixture, will answer for several of the methods to be described; but it is better to wash chromic hardened sections in water and soak them for not less than about half an hour in methylated spirit before proceeding to dye them. Then it will be found that normal and pathological structures take on distinct double and triple and multiple staining.

Methyl anilin violet, and iodine, mulachite or methyl green combined give beautiful results. Aqueous solutions were first worked, but now an alcoholic mixture is used in the following way: Make a saturated solution of violet in strong alcohol and filter. Do the same with the green, leaving some granules in excess at the bottom of the vessel; this solution is a greenish-blue. Filter and add the violet solution to it, drop by drop, till the mixture is the color of Prussian blue, which soon occurs. If a large quantity be made for future use, add a little strong carbolic acid solution about three drops to the ounce of the solution. Filter about twenty drops into a watch glass and dilute with spirit and immerse sections for five to ten minutes; wash off excess in ordinary water, or better drain off on filter paper, and set in saturated solution of acetate of potash. This gives good preparation for several weeks, but the dyes may be fixed by placing the sections for three to five minutes in a mixture of equal parts of a pure saturated aqueous solution of tannin, to which a little carbolic acid has been added, and distilled water. Then wash in water and transfer, for the same time, to a mixture of rather more than one part of tartar emetic and rest distilled water; wash and put in strong methylated spirit for five to ten minutes; draw off excess of spirit on filter paper, and put for five minutes in oil of cajeput, cloves, juniper, aniseed or turpentine, and mount after drawing off excess of oil—in Canada balsam or dammar. The tannin and antimony solutions should be filtered into a watch glass before using, as also should be the dyes. If this process be successfully carried out, very striking results are obtained. Connective and elastic tissue and cell protoplasm are stained violet; nuclei, nucleoli, young cells and leucocytes are greenish-blue. The nuclei of unstriped muscle-fibres and the nuclei of the sarcolemma of striped fibres are blue, and blood is rusty brown. The young cells of tumors, especially cancer and sarcoma, are greenish-blue. Sections of lymphatic glands are very pretty, the leucocytes being blue and the rest violet; and, if the tumor cells be present, they are greenish-blue and readily made out.—*British Medical Journal.*

Minute Pathology.—Fehleisen has cultivated micrococci taken from the lymphatic vessels and subcutaneous connective tissue of patients suffering from erysipelas. Inoculations were performed on rabbits and on man with success. Prompted by the

knowledge that erysipelas has done good in some cases of tumors of the skin, the following procedure was carried out: Some of the fluid containing bacteria of the fourth generation was taken, and inoculated by five punctures into the surface of a tumor situated on the left buttock; four days later genuine erysipelas and high fever set in. The whole erysipelatous process lasted ten days and ended in recovery. The smaller superficial nodules on the tumor became softer and completely disappeared during the first few days of the induced erysipelas, but the main mass only diminished a little in size.—*London Med. Times and Gazette.*

Tubercle Bacilli in the Urine.—Professor Rosenstein, of Leyden, has described a case in which bacilli were found in the urine in considerable numbers, and it is an instance in which the discovery of uro-genital tuberculosis was otherwise equivocal. The presence of the bacilli of tubercle in the pelvis of the kidney has been demonstrated in the dead body by Lichtheim, but they have not until now been found in the urine during life.—*Lancet.*

Bacterial Pathology.—The *Lancet* furnishes the following comments: Among important observations which have been published recently regarding the relation of bacteria to disease, three—concerning syphilis, whooping-cough and dental caries—deserve especial mention. Aufrecht, Birch-Hirschfeld and others have published observations as to the occurrence of special organisms in syphilitic new formations, and some further investigations have lately been conducted by Dr. Morison, of Baltimore, at Vienna, in a clinique of Professor Neumann. In fifteen patients under treatment he found bacilli constantly present in the pus collected from the surface of the chancres and in papular syphilides. The organisms were present in the deeper parts of the exercised papules, and in the blood which escaped from the exposed surface. The pus was collected by means of a wire previously heated in a flame, and placed on a cover-glass which had been heated in a similar manner. The pus on the glass was then dried, warmed at the flame, immersed first in acetic acid, and then in absolute alcohol. After a fresh desiccation, it was treated with methyl blue or with fuchsine. At the end of half an hour the specimen was immersed in a solution of nitric acid (1 in 6). A microscopical examination then showed an immense quantity of cylindrical bacilli, readily distinguished by

their intense coloration from the anatomical elements. The author does not venture to assert that these organisms are the same as those which have been described by Birch-Hirschfeld, as the specific organism of syphilis, but he adds that he has met with other bacteria in the pus of soft chancres, longer and more delicate, very much like the bacteria of anthrax but quite distinct from those which he has found in syphilitic productions.

In the sputa of patients suffering from whooping-cough, M. Burger has found organisms which he regards as pathogenic. They present the form of bacilli, some connected in chains, but most of them disseminated over the field, and giving the idea of micro-organisms in active process of segmentation. They differ from the leptothrix buccalis, the rods of which are both longer and larger, and which occur chiefly about the masses of buccal epithelial cells. In order to demonstrate the supposed bacilli of whooping cough they must be colored by means of an agueous solution of aniline and then with fuchsine or menthyl violet, using solutions which are not too concentrated.

From a series of researches on the part played by organisms in the causation of dental caries, M. Miller concludes that they cannot be regarded as the primal agents. Decalcification by acids generated by decomposition, etc., leaves the tissues of the tooth porous, and on it the organisms, bacilli, and cocci, then develop. The bacilli can be traced into the ramifications of the dental canaliculi. They have no power on a tooth otherwise sound.

FOLIA CAROBÆ—JACARANDA CAROBA.

BY MRS. LOUISA REED STOWELL, IN PART 2 OF "MICROSCOPICAL DIAGNOSIS."

THE Caroba leaves of commerce are obtained from a native tree of Brazil. It belongs to the family Bignoniaceæ, and has been honored with a number of names. The correct one probably is Jacaranda Caroba, given it by De Candolle; although the name Jacaranda Procera, given by Sprengel, is in quite common use. Martins called the tree Cybistas Antisyphilitica, and Vellos gives it the appropriate title of Bignonia Caroba.

The medicinal properties of the tree are found principally in the leaves, and their beneficial effects have been known for a long

time to the native doctors of the aborigines of Brazil, and it has been used extensively by the Brazilian physicians. John Alves de Canerio, an eminent physician, submitted it to the Academy of

FIG. 1. Jacaranda Caroba. One Branch of a Compound Leaf. A Pinna or Leaflet. Natural Size.

Medicine at Paris, and from this introduction it was described in the Materia Medica. Mr. Camillo Weber, a licensed apothecary of Leipzig, Rio de Janerio and Montevideo, during his sixteen years residence in Brazil and South America, became acquainted with the extensive use which the resident physicians made of the Caroba leaf. By his recommendation it was introduced into Hamburg by J. Von der Heide, an apothecary.*

The tree grows to a height of from 30 to 40 feet. The root is externally of a dark red, internally of a yellowish white color. The

*Dr. Ottoker Alt. Hamburg, in the Pharmaceutical Zeitung, Bunzlau, Berlin.

flowers are red and white in showy terminal cymes, and they have an agreeable honey-like flavor; the fruit is a woody bivalved capsule, containing several winged seeds. The stems are considerably branched and produce large compound leaves. The beautiful dark green leaves are bipinatified, being divided into from six to eight pinnæ, while each pinna is divided into from eight to twelve pinnules or leaflets. The illustration represents only one branch or

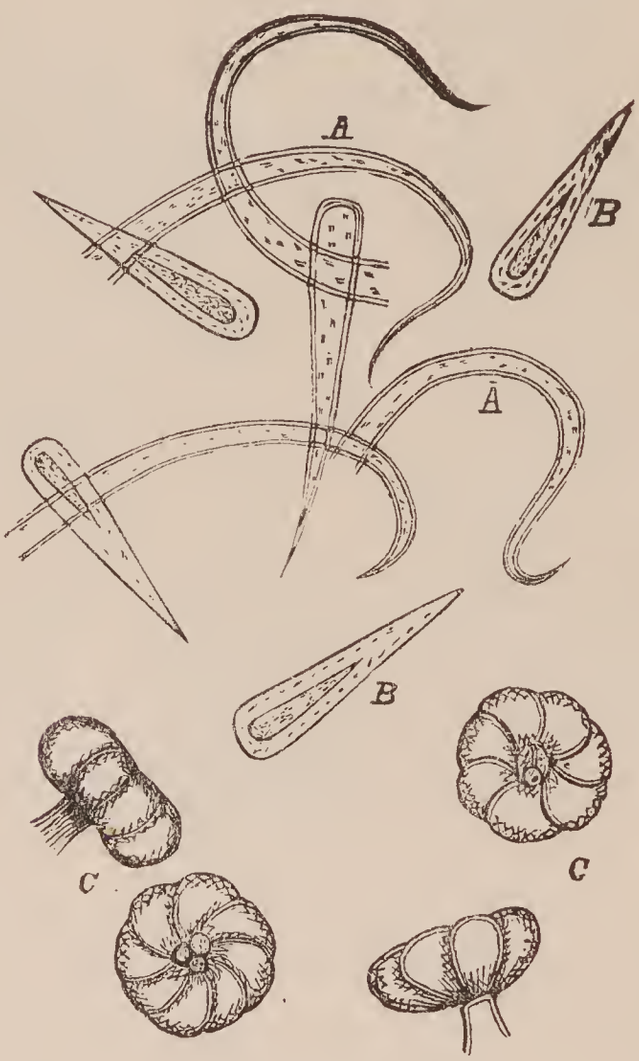


Fig. 2. Epidermal Hairs and Glands from the Caroba Leaf. *a*, Hairs from the Under Surface. *b*, Hairs from the Upper Surface. *a* and *b* Magnified 100 diameters. *c*, Glands. Magnified 500 diameters.

pinna of the leaf (see fig. 1). The leaflets toward the end of the pinna are seen on the upper side, while the under side shows in the others. Each leaflet is oval, sharply pointed at the apex and the base, and with a smooth border. The upper surface of the commercial leaflet is dark brown and smooth, while the lower surface is much lighter in color, and with strongly marked midrib and veins;

and is wooly on close inspection. The wooliness is caused by the presence of numerous long, slender and empty hairs (see *a*, fig. 2). The hairs are of an unusual length and thickly covered with minute projections of cellulose.

There are only a few hairs found on the upper surface of the leaf. They are much shorter, broader and only faintly marked with projections. (See *b*, fig. 2.)

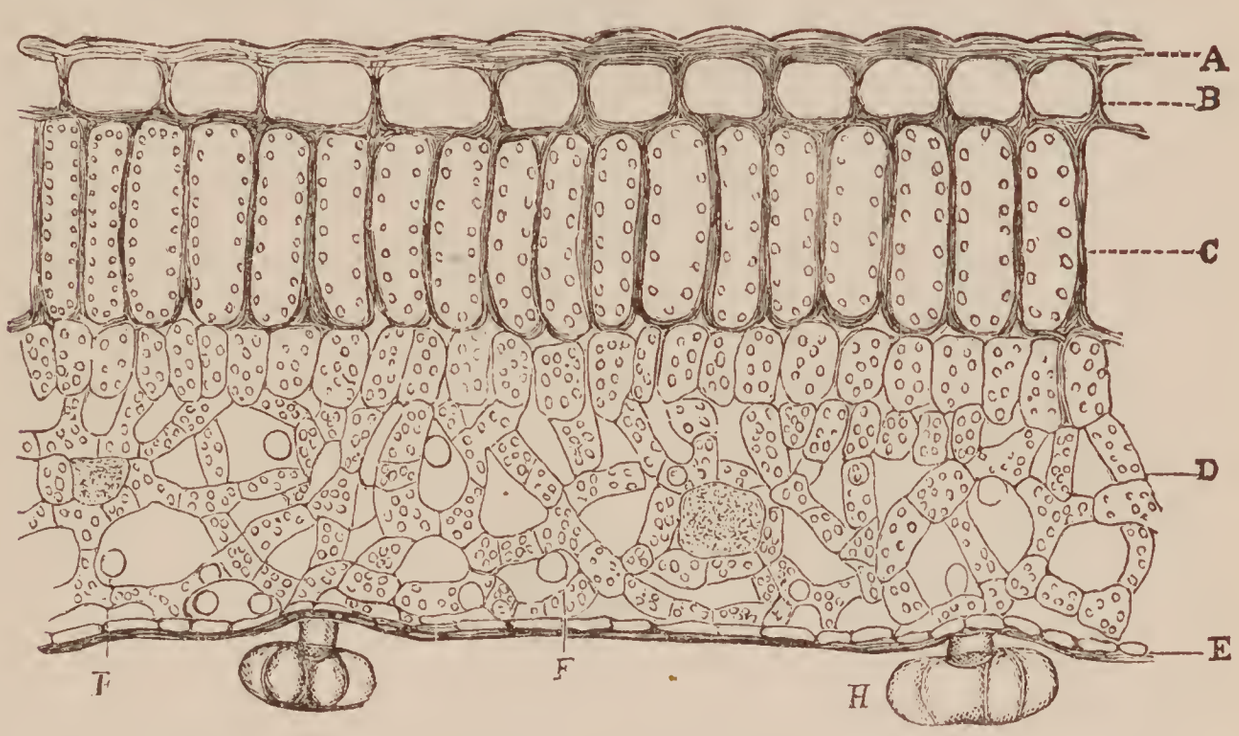


FIG. 3. Leaflet of Caroba. Cross Section. *a*, Cuticle. *b*, Epidermal Cells. *c*, Palisade Cells. *e*, Lower Epidermis. *f*, Oil Drops. *h*, Epidermal Glands. x 500 diameters.

There are in addition to these hairs some beautiful glands thickly scattered over the leaf surface (see *c*, fig. 2). These are wheel-shaped, and composed of eight or ten cells. In the dried leaf they are of a reddish brown color, and probably contain oil and some of the essential properties of the leaf. Similar glands are found on the surface of a few other kinds of leaves, and they generally contain "secreted resinous, gummy or other substances."*

The cross sections of this leaflet gives the usual leaf structure (see fig. 3). A thick cuticle protects the leaf on the upper surface (*a*). The epidermal cells (*b*) are unusually large. Directly beneath these are the long slender palisade cells, filled, when fresh, with bright green chlorophyll; but in its dried condition filled only with dead brown chlorophyll bodies. The lower half of the leaf is composed of the usual loosely packed parenchyma (*d*) with occasionally

*See Bessy's Botany, p. 96.

drops of oil and grayish colored, granular masses. The lower epidermis (*e*) is much more delicate, while the cells are either collapsed or are smaller, and the cuticle is thinner than the corresponding parts on the upper surface of the leaf. Two of the large epidermal glands (*h*) are yet attached to the lower epidermis.

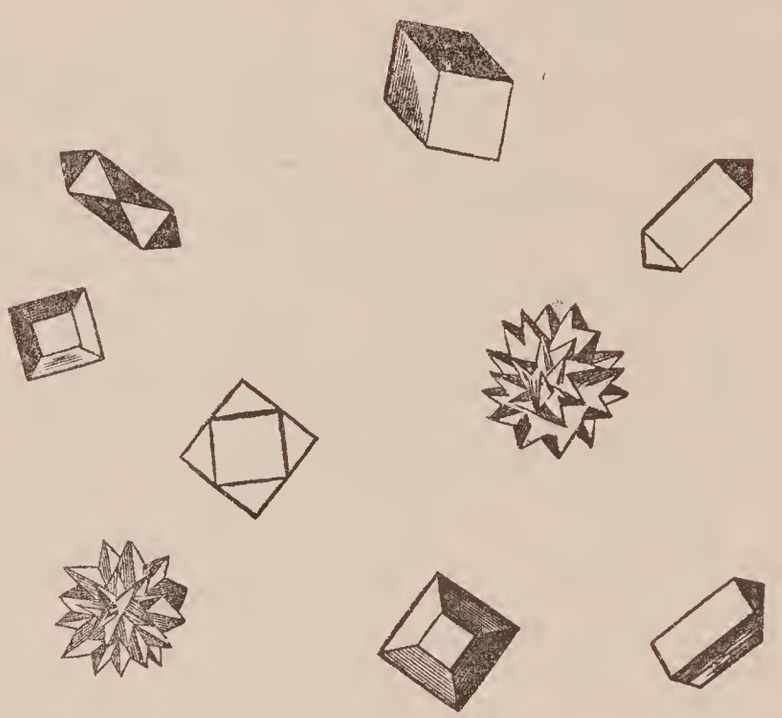


FIG. 4. Crystals Found in the Caroba Leaf. x 750 diameters.

A chemical examination of the leaf has been made, with the following results.* In 1,000 grammes of air-dried leaves there were contained:

Carobina	1.620
Crystallic carobic acid	0.040
Crystallic carobic, sebacylic acid	1.000
Carobon (balsamic resin)	26.666
Neutral resin—not perceptible to taste or smell	33.334
Chlorophyll and vegetable wax	9.000
Extractive matter	10.550
Extractive matter, tartaric, lactic and oxalic acids	10.000
Malic acid and calcium	0.200
Tannic acid	4.390
Albumen, dextrin, malic acid, inorganic salts, etc., fibrine and water	885.010
Balsam (extractive matter)	14.420
Substance resembling humus	0.890
Bitter substance	2.880

*This report was given by Chas. W. Zaremba, M. D., in the Therapeutic Gazette of February, 1880, p. 34.

PARRIRA BRAVA.

BY CARRIE L. BARKER.

THE true parrira brava comes form Brazil and Peru. It is a tall woody climber with large cordate leaves, very small unisexual flowers and purplish-black, ovoid, one-seeded, dropacerus fruit, which forms thick bunches resembling grapes in appearance.

The part found in trade is the long, twisted root or under-ground stem generally cut into pieces from three to six inches long and from one-half to three inches in thickness. Externally it is of a blackish-brown color and is marked with transverse ridges and also with longitudinal wrinkles.

On making a transverse section we find that it is internally of a light-brown color and has a waxy appearance. We further find that it consists of a central column one-fifth to two-fifths of an inch in diameter—composed of from twelve to twenty converging wedges of wood tissue—and of from three to four concentric zones divided from each other by a wavy, light-colored line. Crossing these zones are wedge-shaped woody rays quite irregularly distributed and separated from each other by rather narrow medullary rays.

Microscopical Examination.—The part of the plant which I examined was the under-ground stem, it being preferred in trade. I found on making a cross-section of the bark that it consisted of from eight to twelve rows of cork cells. It was impossible, however, to determine the exact number of rows in this layer as the outer bark chipped off and was very irregular. The middle or green layer consisted of oval cells with a few large stone-cells scattered about. The greater part of the stone-cells were in large clusters. The bast or inner layer was rather narrow and composed of angular prosenchyma. The longitudinal section of the bark showed nothing new and was of interest only in that it proved that the large scattered masses found in the middle layer were stone-cells and not long wood tissue.

A transverse section of the stem showed the large woody bundles composed of angular prosenchyma and with large circular openings scattered about the ends of the vessels. Surrounding these bundles were the medullary rays composed of tabular thin-walled cells. The light-colored line which separated the concentric

zones was made up of cells closely resembling those of the medullar rays.

The longitudinal section showed the pitted vessels surrounded by long, sharp, pointed prosenchyma and the somewhat tabular cells of the medullary rays. The middle and inner barks and the parenchyma were loaded with starch.

Adulterations.—At one time the true parrira brava nearly disappeared from the market and various varieties were introduced to take its place. Among these were the following:

1. The stem and roots of cassampelos parrira L. This can be readily identified as a transverse section shows no concentric rings of wood nor is the arrangement of wedges oblique.

2. Common "false parrira brava," is of a bright yellow color within and has a yellowish bark. It can be identified by the color without a microscopical examination.

3. There is also a variety having a blackish bark, but with the interior nearly white. It is nearly tasteless while the true parrira brava is exceedingly bitter.

4. Aereal stems are also found in trade but they have a distinct pith and a less waxy appearance. In the underground stem the pith, if any, is reduced to a mere point.

A PARASITE IN THE RED BLOOD CORPUSCLES OF A TURTLE.

BY W. H. BIRCHMORE, M. D.

AN article in your last issue on a parasite in the red blood corpuscles of the terrapin recalls the following: It was in August, 1870, I found a common mud turtle on the road side in Dorchester, and took it home to sacrifice it at the altar of Athens. In dissecting, I noticed the blood was extravasated in spots, so I set to work to examine it. In addition to the blood corpuscles were bodies about one-half their size, exceedingly transparent, but as they rolled on, by oblique light, they glistened. Indeed, with spontaneous motion these bodies would attach themselves to a corpuscle's edge, and, as it were, envelope it, after which the corpuscle seemed shrivelled. I was not at that time impressed with the importance of my find, nor had I the needed skill to make a proper investigation. I am sorry I can not be more satisfactory. I also found similar bodies in the muscle capillaries.

MICROSCOPY IN THE UNIVERSITY OF MICHIGAN.

BY C. H. STOWELL.

IT is the intention of this article to give the readers of THE MICROSCOPE something of an idea of the nature and extent of the microscopical work in this University. I shall not attempt to give a history of this branch of study only to state that when a medical student here in 1872 there was but one microscope in the department, and not half a dozen in the whole University. At the present time any student in the University can avail himself of the following work in microscopy:

Normal Human Histology.—This course consists of thirty lectures in the amphitheatre on the use of the microscope and on histology. Classes of twenty are formed for laboratory work. There are five of these classes at work every week, each class meeting on a given day. Thus the student gets one lesson a week, from 1:30 to 5 P. M. Each afternoon lesson is preceded by a quiz and by a description of the work for the day. These classes continue for fifteen weeks, when other classes are formed. The first two lessons are preliminary ones. The student is taught the manipulation of the instrument, use of accessories, etc. Then follows the study, of such subjects as blood, epithelium, bone, tooth, cartilage, elastic tissue, muscle, kidney, stomach, liver, intestine, brain, spinal cord, and various miscellaneous subjects, as the œsophagus, tongue, skin, etc. The students are given instruction in mounting so that each specimen is preserved as it is studied. The average number of mounts per student is about twenty. Each student is required to have at least twelve mounts, and some ambitious ones mount as high as fifty or sixty. Over six thousand mounts are carried away, each year, by students in this department. The object of the course is, first, to make the student better acquainted with the structure of tissues, and second, that he may become familiar enough with the microscope and its manipulations to work to advantage without the aid of an instructor.

Vegetable Histology.—The first course consists of work in structural botany for a term of twenty weeks. Lectures are given on all subjects studied in the laboratory, in about the following order: First, preliminary work with the microscope, how to manipulate it, how to use accessories, etc. Special attention is given to the correct

representation of microscopic objects on paper. Sixty accurate drawings, at least, are required of each student. These are drawings of the various structures examined during the course, the specimens being prepared by the students themselves. The subject of vegetable protoplasm is then taken up and studied with the special view of ascertaining the effects of the various reagents employed in general laboratory work. Then follow lessons on the vegetable cells in all their various forms and combinations which make up the minute structure of the stems, roots and leaves of the different groups. The study of diatoms and other miscellaneous subjects enter into the course. Each student is required to give three forenoons to laboratory work and to prepare and mount a given number of specimens.

Course two in vegetable histology consists of work in pharmaceutical botany, three forenoons of laboratory work each week for twenty weeks. After an elementary knowledge of structural botany is obtained the study of the minute structure of the medicinal plants is entered upon. Sections are made of the various roots,stems,leaves, fruits and seeds and accurate drawings of the same required. The commercial fabrics and the various powders are also studied. Especial attention is given to the study of the powdered spices for the detection of adulterations. At the close of the course each student chooses a particular drug, studies it thoroughly, and presents the results of his labors in the form of a thesis.

Advanced Normal and Pathological Histology.—Any student who has completed the primary course in the histological laboratory, or who has performed an equivalent amount of work in some other institution, can enter the class for advanced work. The first work here is in testing objectives with test-plates and diatoms and in becoming more famaliar with a few useful accessories. The art of injecting is then taken up and the frog and cat are experimented upon, as well as individual organs from larger animals. Each student then chooses some particular organ or tissue and prepares it in as many ways as possible for study. He thus becomes familiar with the various methods of hardening, cutting and staining. Pathological structures are now carefully studied. This includes the study of inflammation and its results; the study of diseased organs and tissues and of the non-inflammatory new formations.

Embryology.—A study of the development of the chick, including microscopic sections of the same.

Urinalysis.—A course of six weeks in the chemical analysis of the urine, including the use of the microscope in determining the character of the various deposits and crystals.

The following is abridged from a report presented to the Board of Regents the last college year :

"The special committee appointed by your honorable body at the meeting in May, 'to take into consideration the relation of instruction in microscopy to the various departments of the University,' and to report at the June meeting some 'systematic plan for such instruction,' embodying recommendations touching the question of fees for the use of microscopes, "and other matters pertaining to such instructions," beg leave to present the following report;

"It is not necessary to conceal the fact that we have found the duties imposed upon us, as exacting and delicate as they are honorable and responsible. We have discovered complications and conflicts which, at first, seem hardly reconcilable with an economical, efficient, and mutually satisfactory scheme of simplification. We are happy to state, however, that we have finally agreed upon a plan of organization of microscopical work in the University which seems to fulfill the most essential requirements, and secures, so far as we are informed, the approval of all who are immediately concerned.

"Few among us were aware of the magnitude to which the microscopical work in the University has grown. The modern methods of research in all the physical and biological sciences have involved more and more an appeal to the microscope to resolve for us the last problems in the sciences of matter and of life. It may be set down to the credit of the teachers of science in the University, and thus to the credit of the University, that we have not been left behind in the adoption of the improved methods of research. Undoubtedly there may still be those outside the ranks of scientific investigators and teachers, who only know the microscope as a toy which excites wonder by its revelation of the hairs on a fly's leg or the animalcules in a drop of stagnant water. But such inadequate conceptions must exert no influence in pre-

scribing the limitations to be set to the researches of a professor in the University.

"The committee have held seven formal meetings, and have had numerous individual interviews with each other and with those interested in the use of microscopes. They have had a separate and special consultation with each instructor having microscopes in charge, and have obtained written statements embodying desirable statistics, and the views of the several instructors respecting the proper demands of their respective chairs, and the most practicable method of uniting all the operations and all the interests in a single scheme. We have been met by a spirit of accommodation and even of self-sacrifice which deserves the expression of our thanks.

"*We find a total of 104 microscopes belonging to the University and employed in different branches of instruction.

"The total cost of these microscopes and the accessories used with them is about $5,252. Omitting the first-class Grunow microscope purchased in 1856 for $500, including a complete outfit of accessories, and an old Powell and Leland valued at $150, and also an old inverted microscope set down at $50, the purchases made in recent times, that is, since 1872, amount to about $4,568. The present value of all these instruments and accessories may be put at $4,618. The deterioration of microscopes and their accessories, when properly used and protected, is not rapid, except when the brass-work is unavoidably exposed to corrosive fumes, as in the investigations in a chemical laboratory.

"Your committee have considered the practicability of concentrating into one central laboratory all the microscopic instruction and investigation undertaken in the University. A moment's consideration, however, suffices to show that this cannot be done in an absolute sense; though we shall recommend an approximation to it. There is a large demand for the use of microscopes in immediate connection with the materials to be investigated, and which are and must remain somewhat scattered. The microscopes in the chemical laboratory, for instance, are brought into requisition in connection with the reactions of manipulatory chemistry, and often in the progress of a manipulation. The instruments must be momentarily accessible to the room for chemical operations. In

*This number has been increased by twelve giving a grand total of 116. Ed.

botany and zoölogy the conduct of instruction in certain courses, which are generally given to small classes, must rely on the use of the microscope in immediate connection with the instruction. Such are courses in the fructification of *algæ*, in the forms and structures of diatoms, in the forms and structures of *infusoria*, and in the development of the embryo. Entirely similar are the requirements in palæontological courses, involving the study of the minute structures of the shells of fossil brachiopods, or of the coral skeletons of polyps. The same must be said in courses requiring the study of the optical characters of minerals. Moreover all the advanced courses in the subjects consist of researches through a wide range of specimens belonging to a given class, and which must be obtained from the museum collections. Finally, the methods of preparing many of these specimens are quite unlike those employed in the simpler and more usual line of research, so that some special appliances have to be provided which it would be a useless expenditure to provide for ordinary microscopical work.

"The following are the branches of science in which microscopical work is at present carried on in the University:

Human Histology.
Comparative Histology.
Vegetable Histology.
Botanical Research.
Zoölogical Research.
Palæontological Research.
Pathological Anatomy.
Psychological and Analytical Chemistry.

"As a rule, every student entering upon the use of the microscope in any one of these branches is under the necessity of acquiring in the university the skill requisite for successful manipulation. Manifestly, therefore, some advantage would be gained by sending students first to a central school of microscopic manipulation. Here they might be at first restricted to the use of cheap instruments, and thus, perhaps, some costly accidents would be avoided.

"But students learning to use the microscope must employ some suitable objects for examination. These are preferably the ordinary tissues of plants and animals. The study of the microscope involves, therefore, the study of general histology. By the time adequate expertness has been acquired in the use of the instrument and its accessories, the student has made such progress in either vegetable

or animal histology that the subject has been pursued to all the length required by the university courses, or at least to such length that good economy requires the completion of the study in the school of microscopy.

"Now, in this view, the school of microscopy would provide all the instruction needed in human histology, comparative histology and vegetable histology.

"Next, it is ascertained that the same school could similarly furnish nearly all the instruction needed in the college of dentistry and in pathological anatomy.

"Your committee are therefore prepared to recommend as the most practicable, efficient and economical expedient, in the present condition of microscopical work, the organization of a central laboratory for microscopy and general histology.

"Instruction should be given in this laboratory in the following subjects:

1. Microscopical technics, or the science and art of microscopy, comprising:
   - (*a*) The theory and construction of the instrument and its various accessories;
   - (*b*) The methods of determining magnifications;
   - (*c*) The methods of microscopic drawing, microscopic photography, and microscopic projections;
   - (*d*) The preparation of objects of various classes.
2. Human Histology.
3. Comparative Histology.
4. Vegetable Histology.
5. Dental Histology.
6. Pathological Anatomy.
7. Completion of microscopic study in such other subjects as may be desired by professors in charge."

[The above showing is sufficient proof, it seems to me, that the University of Michigan offers far greater advantages, for general microscopical work, than any other institution of learning in this country.—Ed.]

"Your April number is simply elegant."

"I have never seen a finer number of any microscopical journal How do you afford it for a dollar?"

"I regard your journal invaluable to every investigator and student in research with the microscope."

Editorial Department.

WE suggest four things for the consideration of the officers of the American Society. First. Employ a stenographer to report all the discussions of the members and general routine business. Second. This stenographer must mail to each person taking part in said discussions a transcript of their individual remarks for their final correction within five days from the time of adjournment. Third. Pass a resolution that each person presenting a paper at the meeting must hand a corrected copy to the secretary before the meeting adjourns. Fourth. Proof need not be out of the secretary's hands longer than eight days. If not returned by that time then the paper will appear as given to the secretary with only such typographical corrections as he sees fit to make.

There is no sense in waiting a number of months before getting our bound proceedings. They can be in the hands of every member in twenty days from date of adjournment.

Some perhaps will object to paying a stenographer for his work. We will guarantee one thing, that the persons who will object will not be from the west. It is to be hoped that a little western push will be given to slow members next August even if our suggestions above are not wise.

IN some of our cities we have had quite large clubs. A slip was mailed to the members of these clubs asking for their renewals. It is, indeed, comical to get replies that they never subscribed, never owned a microscope, and know nothing about the subject. Evidently to fill out the club some names were added without consulting the parties. The club business is a failure, however, and we have generally abandoned it. If six illustrated numbers of forty-eight pages each, are not worth a dollar, then they are not worth anything.

A FEW days ago we visited one of our large state institutions and upon our arrival were shown to the medical office. Two persons were in the room, a lady and a gentleman. We were intro-

duced to Dr. R——. Naturally we stepped forward and took the hand of the gentleman, when we were informed that he was only plain Mr. M——; that Dr. R—— *was the lady.* We have been teaching lady medical students for a number of years, but did not know before that our own state had a lady physician on the medical staff of one of its largest institutions. Over half of the inmates are women, then why not have a lady attendant? Who can understand their aches and pains as well? And who can tell better when they have the sulks.

WHEN we wrote an editorial some time ago about the new president of the American Society, we said that Professor McCalla had been pastor of one of the largest churches in Chicago. We thought it was true at the time but it seems that he was not the resident pastor. We were responsible alone for what we stated, but to avoid any appearance of "false colors" we make this simple correction.

OUR journal is increased this year to forty-eight pages, notwithstanding the fact that we were kept from editorial work a whole winter. Now, if our subscribers will all renew and help us a little by giving us contributions and new subscribers, we will assure them that soon they will have a journal of twice this size. Our ambition is to get a bi-monthly of one hundred and twenty pages each issue. Will you not help us?

HAVE you ever seen any of those beautiful diatoms mounted by Mr. Peticolas, of Richmond? They are indeed beautiful and valuable as well, for each slide is labeled for locality, habitat and species.

REMEMBER, please, that one dollar is not much for you, but in the aggregate it is everything to us. So renew at once, if you have not already done so.

Selections.

THE CLINICAL USE OF THE MICROSCOPE.—As every doctor now needs a microscope, and most of them want one, and many of them have not yet obtained one, perhaps a few hints of practical nature on microscope construction and power may be acceptable. Every man, before he buys a microscope, must know what the instrument can do, and why it can do it. The fact is that many microscopes—stand, lenses and all—may be sold at a very high price, and not be very useful instruments, and, at the present time, very useful instruments are sold at very reasonable prices. In buying a microscope, the stand is, of course, the first factor to consider. Stands are made of various patterns, and many of them are useless and uncalled for. Many of the old incumbrances of mechanical stages, etc., are no longer used, and were never of any use. At the present time microscopists themselves are wrangling over the most desirable weight and size of a microscope stand. It is very evident that different men differ in the size and weight of their opinions about the most desirable size and weight of a stand, and that different men like different sizes and weights.

The various American makers build stands of different weight and size for different people and purposes, and all of these stands, it may be said, admit of the use of the best objectives and other accessories of the microscope. If other things are equal, the owner of a microscope will, as a general thing, be better satisfied with a stand of good size and with weight enough to resist most of the modes of motion which constantly pervade the air and ground, and houses and furniture of rooms.

A stand which will admit of the use of any microscopic accessory, and of good weight and size, can be bought for from $25 to $75, and the best that can be made, even if all made of brass and in the best manner, and having all the qualities which are necessary to go with objectives of the highest power, and which can be used for any purpose where a microscope is useful, and which are handsome enough, and practical enough, and scientific enough, need not cost over $160.

The next article, which it is of greatest importance to know

something about before owning, is the objective, and to understand this subject in its outlines, we must review, briefly, the nature of the things to be seen by the objective, and the powers which the objective must have in order to make these objects visible.

Objects which are visible to the eye present to the mind the image of the object as a whole, and more or less of the structural elements or factors of the object. We see many objects as a whole every day, the small parts of which, or the anatomical elements or factors of which, we cannot see, because they do not come within the angle of vision of the eye. We can see the images of small animals perhaps, whose ears and eyes, and perhaps other members are not visible.

Now, the same laws, of course, hold good in microscopic objects. An object, as a whole, may be too small to be seen by the eye—for instance, a diatom, or blood globule, but a lens which amplifies the object five or fifty diameters, will enlarge the apparent size of the object, by its amplifying power, and will make visible more or less of its anatomical or structural factors, by reason of its angular aperture, as well as its focal distance, or refractive power.

There are two factors then in the power of objectives which aid vision, and in selecting an objective both of these factors must be considered. The distinction to be borne in mind is that the focal distance has relations of particular character to amplification of the general image, and the angular aperture has more special relations to the resolution of the structural elements of objects which are looked at through a microscope.

An objective must have enough angular aperture to delineate or resolve the smallest elements of any general image, so as to admit of their amplification, and the objective (with eye pieces) must have refractive power enough (focal distance) to amplify the general image and images of the structural elements, so as to form a visual angle.

Just what a visual angle is, I don't know, but it is said to represent the distance between two contiguous rods or cones in the *fovea centralis.*

I have said that the average eye can see lines ruled on glass about 200 to the inch, or the eye can see structural elements in any object which have a size of $\frac{1}{200}$ of an inch. Now any object, big or little, which can be seen by the eye, if it is made up of structural

elements less than $\frac{1}{200}$ of an inch, these elements cannot be seen by the eye. If a house, or barn, or an elephant, is composed of structural factors no larger than something smaller than the $\frac{1}{200}$ of an inch, these elements cannot be seen by the eye, any better than they can in any object a thousand times smaller, and the reason is that the angular aperture of the eye is not wide enough to permit these small things to be seen. If a microscopical house, composed of elements $\frac{1}{200}$ of an inch in size could be amplified by lenses which did not have an increased power of delineating small objects, it would make no difference how much the apparent size of the house was amplified, even up to 5,000 diameters, the structural elements of the house would yet be invisible.

Now in looking at a diatom which has lines so close together that the lines and spaces between them cannot be delineated or resolved by the objective which is being used on account of its narrow angular aperture, no amount of amplification of the image of the diatom, by the objective and eye pieces, even up to 5,000 diameters, will make the lines on the diatom visible. But now if an objective, of greater or less magnifying power, be substituted, which has a sufficient angular aperture to delineate these lines and spaces, they can be seen, if the whole diatom is magnified only a few hundred diameters, instead of 5,000.

Magnifying or refractive power, then, or focal distance is not the only factor necessary in an objective, though it was formerly thought to be. The popular idea is even at the present time, that the power of the microscope has direct relations only to the magnifying power of the lenses, especially to the objective. Objectives were formerly constructed with narrow angular apertures, even when made with the highest amplifying power. The fact that an objective was a $\frac{1}{16}$, or a $\frac{1}{20}$, was considered to be proof of its high power. This is only proof that it can amplify the image of a diatom a certain number of diameters, but is not proof that it can show the finer lines of a diatom, or other equally small elements in a general image which is magnified. Beal and Carpenter used objectives of $\frac{1}{20}$ and even $\frac{1}{50}$ inch focal distance, but with narrow angular aperture, and the fact has been since learned that objectives of $\frac{1}{8}$, or $\frac{1}{10}$ inch focal distance are far better instruments, providing they have wide angular apertures. Perhaps the best objective made and which reaches the limit of possibilities in the power of objec-

tives is a $\frac{1}{10}$ inch, having an extreme angular aperture of 180 degrees.

The reasons of this are evident from what has been said, viz: that amplifying power belongs to eye pieces as well as to objectives, and the further fact that an angular aperture of 180 degrees reaches the limit of construction, and that lines or elements of structure of objects having a little less than $\frac{1}{150000}$ inch is the limit of the resolving power of objectives.

The power of resolving lines and spaces between them, or other elemental structures of objects having the size of $\frac{1}{150000}$ parts of an inch is the work of that factor of an objective's power which is given by its angular aperture and not by its magnifying power. When these lines are resolved by the objective they must then be amplified by refractive lenses until they are large enough to form a visual angle, and it is found that an amplification of 750 or 1,000 diameters is sufficient to do this work. A $\frac{1}{10}$ objective with a one-inch eye piece will give these lines and spaces an amplification of 1,000 diameters, and therefore a $\frac{1}{10}$ objective, having an angular aperture of 180 degrees, resolving 150,000 lines to the inch (nearly), is the present limit of microscope construction, and represents all that eye pieces and objectives can do as aids to human vision.

Now a $\frac{1}{20}$ objective, having an angular aperture of 180 degrees, is no better than a $\frac{1}{10}$ objective having the same resolving power or angular aperture for these reasons: If we have the 150,000 lines resolved by an objective, it is necessary to magnify them 1,000 diameters to see them. It is immaterial whether they are magnified with an objective or with an eye piece. If the objective is a $\frac{1}{10}$, a one-inch eye piece is requried to magnify the image of the resolved lines to 1,000 diameters. If the objective is a $\frac{1}{20}$, an eye piece of two inch focal distance is required. So there is no possible advantage in having a $\frac{1}{20}$, or a $\frac{1}{16}$, or a $\frac{1}{12}$, or even a $\frac{1}{10}$ objective, for a $\frac{1}{8}$ inch focal distance objective will do all the work that any objective can do with the proper eye pieces.

To magnify a resolved image to 1,000 diameters we can use either of the following combinations:

$\frac{1}{5}$ inch objective, and $\frac{1}{2}$ inch eye piece.
$\frac{1}{10}$ " " " 1 " " "
$\frac{1}{20}$ " " " 2 " " "

The character of the image which is magnified, so far as the

number of lines per inch, or equally small objects, is concerned, will depend entirely upon the angular aperture of the $\frac{1}{5}$ or $\frac{1}{10}$, or the $\frac{1}{20}$ inch objective which is used in this combination. Now, of course, deeper eye pieces may be used, and the image may be magnified up to perhaps 5,000 diameters, but this amplification will show nothing new in the image, it will only give greater distinctness to the details, and lessen the extent of the field, or number of lines in the field.

But not all objects which are looked at through the microscope contain 150,000 lines to the inch, or other objects of equal size, nor anything approaching it. In medicine, or clinical use, lower power, and lower angular objectives are oftener required than higher. The extreme angular apertures exhibit objects which are of course no wider than they are thick, and hence such objective does not have enough of what is called penetration to properly exhibit such objects.

The rule is to use an objective with an angular aperture, and power no higher than is required to properly resolve and magnify the object. Using an objective of 180° angular aperture on an object having only 300 lines to the inch, would be like using the telescope in the Washington Observatory for an opera glass. It is evident, therefore, that objectives having low magnifying power and angular aperture are necessary in the microscope. Perhaps the following list will comprise a battery of objectives which will most satisfactorily cover the whole ground of microscopy:

A 3	inch of	10°	angular	aperture.
" 1	"	25°	"	"
" $\frac{1}{2}$	"	45°	"	"
" $\frac{1}{8}$	"	180°	"	"

This list of objectives, with a set of eye pieces of two inch, one inch, one-half inch, and one-third and one-fifth inches, will enable the microscopist to resolve any objects resolvable by objectives, and magnify them as much as there is any necessity for magnifying them.

The higher power objectives are made with a screw collar adjustment, which, by approximating the elements or lengthening the space between them, adapt the objective to different conditions, which arise from using different fluids for immersion, and for various thicknesses of cover glasses. In such objectives there is no doubt

but the screw collar is a necessity. Objects only 140,000 to the inch, or more or less, are difficult to focus, and cover glasses and other conditions may make it impossible to focus them. In lower powers, unless the angular aperture is very high, the screw collar is not a necessity.

In purchasing a microscope, one of American make is generally preferable. The stands of medium size and weight, made by Bausch & Lomb, of Rochester, N. Y., or Tolles, of Boston, are excelled by no makers; neither are their objectives. My own stand was made by Tolles, after plans devised by Dr. Geo. E. Blackham, and the low power objectives and one-eighth of 180° were made by Bausch & Lomb. No doctor can get any good out of a poor microscope, for the reason that toys do not even amuse grown up people for any length of time.—Dr. R. J. Curtis, in the *Peoria Medical Monthly*.

THE PHYSIOLOGY OF THE OYSTER, OSTREA VIRGINIANA. By Prof. Samuel Lockwood, Ph. D., Secretary of the New Jersey State Microscopical Society.

1. *The relative parts.*—After saying that, in deference to his audience, he would avoid technicalities as much as possible, taking from the table a round clam, or quahaug, (*M. mercenaria,*) the professor said he would use that shell for the purpose of introducing the oyster. The round clam is somewhat of a traveler, ploughing its way through the mud with its great pedal disc, which is thrust from the opened shell. Let me put the shell in its natural position for such work. Here it is—the edge downward and the thick, or hinged, side uppermost. You notice I have the two beaks turned from me. The ploughing foot would, if protruded, be towards me. The side of the shell at my right hand is the position of the right side of the animal, that to my left is its left side; the side uppermost is its dorsal side, and the one below, that is, the one which enters the mud, is the ventral side. But we have to view the oyster differently. Except in the embryo state it is no traveler. Once settled it becomes a fixture for life; and in its normal position it lies on one side. The two valves of this clam are equal, but those of the oyster are very unequal. One valve is almost flat. It is on this that the caterer serves the mollusc when taken on "the half shell." The other valve is rounded and deeply dished, and much the heavier of

the two. Oystermen call the thin end the nib, and the thick end the bill or beak. I now hold this oyster in my hands edgewise, so that the flat valve is next my right hand, and the round valve next my left hand. The nib faces me, and the beaks are from me. The flat shell is the right side and the round shell is the left side. The under edge is the ventral, and the upper edge the dorsal part. The popular notion is that the thin part of the shell, the place where the knife enters when opening it, is the forward end of the oyster. This is not so. All will admit that the head end of any animal should be regarded as its front, or anterior end. Now, the cephalic portion of an oyster lies here near the hinge; hence, you see the hinge end, or beak of an oyster, is its anterior part, and the nib, or thin or opposite end, is the posterior part.

Everyone knows that each for himself possesses a threefold physiological system, that is, three sets of organs specialized for three sets of functions. These are, the nutrient, the respiratory and the circulatory systems, so-called. These, as their names imply, have to do respectively with alimentation or food elaboration, with the aeration or oxygenation of the vital fluids, and the circulation of the blood. Let us see if these systems are possessed by an oyster, and to what extent they are developed in a creature so lowly.

2. *Alimentation.*—An oyster is enveloped in a thin, loose membrane, called its pallium, or mantle. This pallium is united for a little way at the left side of the animal, and all round the right side, but at the posterior end it is free. Let us look at this large diagram. I have torn off the right side of the cloak, thus exposing the animal, which, with the flat shell removed, is represented as lying in the round or dished shell. This leaves the prominent organs exposed. The edge of the pallium is beset with rather coarse fleshy hairs, which are cilia. As there are two edges, they make a double fringe. When the shell is a little bit open this ciliated fringe is slightly projected, and is called the beard. The two fringes keep up an incessant vibrating action which sets the water flowing in between them; and another contrivance, soon to be described, carries the food-laden water forward over the body, or ventral side of the animal, up to this spot near the hinge, where it is received on the edges of four flattish lips, the mouth being between the two pairs. We may call these organs palpi, or labial fingers, for they assort this food from the water, which done, the water thus filtered is passed backward on

the dorsal side, by innumerable and invisible lashes. I said invisible, for it requires a high power of the microscope to detect this mystic mechanism. Analogy compels us to believe that it is a similar ciliated movement which carries the food down the alimentary canal. A little way from these lips, or mouth, is the œsophagus, and a little lower, right in the middle of this dark mass, which is the liver, is the stomach. Notice its irregular shape. Now follow the course of the intestine. It extends fully half way to the posterior end of the animal, and then in a surprising manner doubles itself, and extends back again until it almost reaches the œsophagus, where it again recurves, returning nearly to the posterior of the animal, or opening of the shell, where its vent stops at this depression, or region, which, if not organically, is functionally the cloaca. How beautiful this arrangement, for the spot at which the vent stops is directly in the egress current of the clean, but effete water, which is leaving the shell and returning to the sea. Of course you must notice the significance of this irregular stomach, and this long intestinal tract, viz.: for the more complete absorption of the digestible parts of the food. But let me direct your attention to another feature intended to increase the surface of the alimentary canal, and so to increase the area of osmotic action. If I cut across this intestinal duct, getting a transverse section, I find that the form inside differs from that outside, which is cylindrical. Now the inner wall of this tube is convolute. It is much as if a smaller tube was soldered to the inner wall along its whole length, thus greatly enlarging the absorbing surface. Hence a fæcal cast would not be that of a solid cylinder, but in cross section would present a form like that of a dime with a three-quarters of a circular hole punched at its edge. Now, when you consider that in this instance the osmotic action on the food is equal to the surface over which it passes, and that this is estimated by multiplying the length of the canal by the perimeter of the inner wall, plus the perimeter of the convoluted wall, you see how great the surface is, hence how complete is the ingestive system, even in an oyster.

3. *Respiration.*—Perhaps even more beautiful is the respiratory system. Here, in the posterior part of the animal, so as to be near the water, are the branchial plates, or gills. Like the palpi, they are in two pairs, one pair for the left side and one for the right. They comprise an infinity of little tubes, so small that the unaided eye

cannot distinguish them. Each tubule has on one side a row of holes, as if it might be a tiny flute. On these little tubes are innumerable myriads of little cilia, inconceivably small. To see them well taxes the microscope. And how busy they are, as if each tube might be a tiny trireme, manned through its whole length with the little rowers, rowing, rowing, rowing. The function here is very strange, because it seems two-fold. All over the animal are these cilia, and all are lashing the food-laden water to the anterior, where is the mouth. Now, these branchiæ, with cilia on their outer surface, lend their aid to produce this general movement of the water; but to the branchiæ this is only a secondary function. There are millions of these tiny cilia between these gill-flaps, and their primary function is the aeration of the blood. To effect this the filtered water which has left the palpi, or lips, is now lashed by the cilia into the holes of the tubules in the branchiæ; here the air is taken out, and the oxygen eliminated, and the now carbonated water is passed on to the cloacal region, while the opal-hued and oxygenated or revitalized blood is passed to its destination.

4. *Circulation.*—This brings us to the circulatory system. Looking at our diagram we see here a dark crypt, a little mystic chamber. It is the pericardium, or receptacle of the heart. This vital crypt is covered with a thin membrane or translucent caul. Let us, in a reverent spirit, put aside the veil and look in. Here we see the little heart. On the right is its one auricle, receiving the oxygenated blood from these ducts which connect with the gills; and here is the ventricle into which the auricle discharges, and here are two aortas by which the ventricle supplies the blood to be distributed through the one to the posterior parts, and through the other to the anterior parts. It is a wonderful sight. In a freshly opened oyster I have counted the pulsations at six in a minute. Probably in a specimen just from the water it might be as high as ten in a minute. Though I cannot do it now, it is not difficult to demonstrate that the oyster has a complete apparatus of arteries and veins.

Thus it seems that so far as its necessities reach, the three physiological systems are as well developed in an oyster as in a man. But these systems now discussed have their analogical functions in the life of the plant. Hence the three groups of organs, taken together, are often called by the physiologist the vegetal system. I

must ask you now to follow me in the discussion of a system which has to do with sensation and volition, and which is not represented in the plant.

5. *The nervous system.*—Let me draw on the black-board an insect with its wings extended. You see its body consists of three parts, the abdomen, the thorax and the head. On each side of the abdomen is a row of spiracles or breathing holes, for insects never breathe at the mouth. From the thorax project the legs and the wings. At the head we find the eyes, the tentacles and the palpi. I will now draw a line through the middle, dividing the head, thorax and abdomen into equal parts. This line is a great nerve cord. I now make on this cord a triple series of knots, one in the abdomen, one in the thorax and one in the head. These are the nerve ganglia or brain masses. This represents the type of the insect nerve system. The system in effect has three brains, as each set of ganglia is functionally one brain. Let us now on the board diagram a human brain. You see it is in three masses. The forward and largest one is the cerebrum, which serves the functions of sensation and volition. The smaller one back of the head is the cerebellum, which serves the functions of respiration, while this, the smallest, and placed under the others, is the medulla oblongata, and is set for the functions of locomotion. You notice that the spinal cord is united to the mass, especially to the medulla oblongata, which indeed is by some regarded in the light of an expansion or enlargement of the spinal cord. Let us compare this human nervous system with that of the insect. These ganglia making the brain mass in the head of the insect are set for the functions of these organs of the senses, the tentacles, the palpi and the eyes, and what of intellectual power the little thing may have. This thoracic brain mass is for the functions of these legs and wings, that is, for locomotion. This abdominal nerve mass is for the functions of these two rows of spiracles, and the wonderfully complicated apparatus of branchial tubes thus connected—that is, these ganglia serve the purpose of respiration.

The typical nerve system of a mollusc is not arranged upon a straight line as is that of an insect, but as it were upon a circular cord, which can vary greatly as the sides are brought towards each other, thus making a more or less compressed, or narrow ellipse. On this chart is a diagram or plan of the nervous system of the

oyster. From this nerve cord, like an ellipse, are nerve branches extending everywhere. But upon this cord you notice at the posterior part of the animal is a large ganglion, or brain. This serves for the functions of respiration. On this same elliptic cord at the anterior part are two ganglia, connected by a stout thread of nerve. Functionally this is but one brain, like the true cerebrum, which is in two hemispheres. In fact, this is the oyster's cerebrum, and is set for its sensations, and whatever of psychic ability it may be endowed with. Now here seems an anomaly, for the oyster appears to be only double, and not triple, brained. Let me explain this by drawing a plan of the nervous system of a pecten or scallop. You see here in the anterior part is one more brain than the oyster possesses. This is the homologue of the medulla oblongata in man. It subserves the functions of locomotion. But this mollusc while young is so active in its movements as to have been called the butterfly of the sea. Hence it has a nerve mass to subserve that end; whereas the oyster, once settled, never travels, hence it needs no provision for such purpose.

I hinted at the possible psychic power of the oyster, and it was not a figure of speech. This lowly thing has in it some potentiality of education. It can be induced to a change of conduct to accommodate itself to new circumstances. When that terrible little mollusc, known as the Drill (*Urosalpinx cineria*), has bored through the roof of its house, intending to feed on the occupant, the oyster has been known to promptly plug up the hole with nacre or mother of pearl, and thus save its life by keeping the burglar out. I have known an oyster to get badly broken, and to repair its house thoroughly. But as we have yet to describe how it builds its house, and keeps the premises in good condition, also to speak of the friends it entertains and the enemies it encounters, I must hasten on.—Abstracted for *The Planet.*

Microscopical Examination of Drugs.—Through the liberality of Mr. J. H. Redsecker, of Lebanon, Pa., there was offered to the last senior class of the Philadelphia College of Pharmacy, and has likewise been offered to the next class a prize of $20, in the department of Materia Medica, which prize according to the recommendation of the Committee on Instruction, approved by the Board

of Trustees, was to be, and will be, competed for in the following manner: The candidates for graduation attaining the grade very satisfactory in the examination of materia medica specimens and questions, are to examine ten sections of drugs, the prize to be awarded to the one determining the largest number correctly; if necessary, a second and third examination of such sections is to be made by those recognizing the largest number of the first set.

At the recent examination the competitors were nine in number, and on this, the first occasion, it was deemed advisable to prepare several sections of drugs in such a manner that the microscope was not absolutely necessary for their identification, while the largest number consisted of sections especially prepared for the microscope, the cell-contents being removed so that only the structure was visible. The sections selected were of the first-class calumba, cocculus indicus, nux vomica and pumpkin seed, and of the second class, sarsaparilla, taraxacum, veratrum, flat Calisaya bark, clove and conium fruit. One of the competitors determined 9, one 8, two 7, one 6, three 5, and one 3 of the specimens, the two highest being the same students, who without considering this special examination, were awarded the Procter prize. One of the specimens was not identified, a result which is easily understood by those who are familiar with the microscopic appearance of the transverse and longitudinal sections of the calyx tube of caryophyllus, resembling, as they do, a number of rhizomes and roots containing oil cell in the bark. The results of this examination were, therefore, highly satisfactory, the more so as only a very small proportion of these students had previously received instructions in the use of the microscope.

That the microscope is not as frequently used in pharmacy as it deserves to be, is due to a variety of causes, prominent among which is the want of opportunity and for instruction in the application of that instrument for the needs of the pharmacist. The Alumni Association of the Philadelphia College of Pharmacy has, during the past winter, endeavored to supply this want by organizing a class under the direction of A. P. Brown, Ph. G., who is an experienced microscopist. Although only a limited number of students embraced the advantages thus offered, yet the zeal shown was so encouraging that a spring class will be formed early in April,

when instructions will be given in the various microscopical manipulations, in drawing with the camera lucida, in urinary analysis, in section cutting, double staining, mounting, finishing of slides, photomicrography, detection of adulterations, etc. A number of Zentmayer's microscopes have been procured for the purpose, and all necessary arrangements have been made to make the instruction as practical as possible.

On this subject, concerning the use of the microscope in the examination of drugs, we have received a communication from Mr. H. M. Wilder, which we publish in full.

"Professor P. D. Penhallow (Cambridge) has written a small guide for the use of beginners in vegetable histology, consisting of a series of tables giving the action of reagents upon cell-contents, cellulose forms, and plant products, and preceded by short paragraphs upon the special uses of the different reagents and the behavior of vegetable products. This book, or rather pamphlet, of forty pages, has been published in first-class style, by S. E. Cassino, Boston, (printed on heavy paper 9½ inches by six inches, with a very generous margin (1½ inches and 2 inches), has nine blank leaves, and is exceedingly well bound; in view of the "getting up" the price of one dollar is not too much. This is, however, only a rudimentary guide,suitable for beginners. The most complete work on the subject is "Botanisk Mikrokemi," by V. A. Poulsen, Copenhagen 1882, 8vo. (Danish), which has since been translated into German, and, as I see from late French journals, also into French. It treats of all the reagents which up to date have been proposed, 46 pages, then of the behavior of the different plant products, 22 pages, and is preceded by an exhaustive list of over one hundred books, pamphlets and articles bearing on the subject."

"This reminds me that as yet, we have not a single hand-book or treatise on practical microscopy as applied to the requirements of pharmacy, neither in the English, French nor German languages. All that we possess is a short pamphlet of 34 pages, by Prof. Mark W. Harrington, Ann Arbor, on the identification and microscopical examination of crude drugs, etc.; and a series of very thorough articles on the microscopical examination of single drugs, by Hy. Pocklington, which appeared in the London *Pharmaceutical Journal and Transactions*, for 1872, '73 and '74. What we want is a manual of microscopical manipulation, not a mere outline (such we have),

but which goes very much in detail and not only takes up drugs by classes (roots, barks, leaves, etc.,) but shows with every drug separately how to treat it previous to section-cutting, and how to apply reagents to differentiate in the best way the structure, etc. Prof. Harrington has completed a more extended work than his pamphlet, which covers much of the ground here proposed, but it still exists only as manuscript, and will very likely remain in his desk for a long time. Plenty of stray notices will be found in Berg, Schacht, Wigand, Sachs, Vogl, Nägeli, Dippel, Hager, Flückiger, Planchon, and others, not to mention treatises on the use of the microscope in medicine nor the various microscopical journals and articles, but in order to get at them we have to take so many things into the bargain which we feel much interested in.

I should think that Mr. E. B. Stuart, Chicago, or Mrs. Louisa Reed Stowell, Ann Arbor, Mich., would be eminently fitted for writing such a manual."—H. M. Wilder, in *American Journal Pharmacy.*

[Will Mr. Wilder please read the article "Microscopy in the University of Michigan."—Ed.]

Microscopical Appearances of the Nervous Tissues of the Insane.—In the brains of patients who suffered from chronic insanity the microscope revealed atrophy of circumscribed areas of gray matter, and wherever adhesions had existed between the cortex and the pia, profound pathological changes and even total destruction of the gray matter. Pigmentation and degeneration of nerve cells and their processes, patches of induration involving destruction of cells and fibres, minute points of softening, lymphoid infiltration, and amylaceous bodies have been noted. The arteries were often atheromatous, enlarged, contracted at one point and bulging in others, their coats thickened and nuclei increased, with fatty and lymphoid infiltration of the adventitia, deposits of pigment at their branchings and in the perivascular spaces. Aneurismal dilatations of the capillaries and thromboses of the smallest vessels have been demonstrated.

In epileptic insanity the cortical cells have usually been found well preserved. The arteries have generally been found larger than normal, somewhat tortuous, and their coats hypertrophied, but with-

out fatty changes or infiltration of their adventitia. The perivascular spaces have been found wide but rarely containing leucocytes, hematoidin crystals or pigment granules. The induration of the cornu Ammonis described by Meynert has not been observed. In one case characterized by destruction of the temporo-sphenoidal convolution sections of the neighboring gyri showed sclerosis. In one specimen the vessels belonging to the olivary bodies and the pneumogastric nuclei were extremely varicose and twisted. Pigmentation of the cells of the pneumogastric and hypoglossal centres has been observed. The pathological changes found in epilepsy are probably secondary and the results of an intra-molecular disease which has thus far proven beyond the reach of microscopic examination.

In general paresis more pronounced pathological changes have been found. The arteries of the brain have been tortuous, their coats constricted at one point, dilated, thickened, and nodular at another, frequently studded with leucocytes and round bodies which stain deeply and equally well with carmine, logwood, or aniline blue-black. The perivascular spaces were large oftentimes, and contained pigment, hematoidin crystals, leucocytes, and round bodies. Dilatations in the vessels have been noted, but no capillary aneurisms. The coats of the arteries have often been found separated and the spaces thus formed have been filled with white corpuscles. Fatty changes in the walls of the vessels were rare, although granular deposits upon them were common. Minute hemorrhages have often been found, especially where congestive seizures had been frequent. Patches of sclerosis, occurring more frequently in the inner layer of the gray matter, or just beneath it, have been quite common. They have, however, been met with in almost every region of the brain. Degenerations of the cortical gray matter have been most commonly found in the posterior portion of the frontal convolution, in the lower extremity or the ascending frontal and ascending parietal gyri, in the convolutions of the island of Reil and in the cornu Ammonis. In these regions the layers of gray matter have been found indistinct, and in the outer zone made up of granular matter and sclerosed tissue. The brain cells have been frequently found isolated by an increase in the pericellular spaces and their processes wasted or in an advanced state of pigmentary degeneration. The cells appeared shrunken, without

sharpness of contour, and often deeply pigmented. The nuclei have often been absent and the cells filled instead with innumerable pigment granules. The gray matter in the floor of the fourth ventricle has presented a similar appearance, and the cells of the facial and hypoglossal nuclei have rarely been found normal.

Dr. Munson has the following apparatus: The microscope stand consists of a broad tripod base from which rise two columns, carrying the trunnious between which the instrument swings, and can be inclined at any angle. The whole can also be rotated upon its central axis. The mechanical stage is four inches square, and has a rectangular motion to the extent of one inch in each direction. The bar carrying the plane and concave reflectors swings around a centre which lies in the plane of the object, and allows the reflectors to be swung above the stage for illuminating opaque objects. The sub-stage carries the polarizing prism, achromatic condenser, and other accessories, and is arranged for accurate centering and up and down motion, by rack and pinion. The optical tube is 1¼ inch in diameter and is graduated and slides up and down by rack and pinion. The fine adjustment is by lever and screw. There are four eye-pieces; No. 2 being supplied with an indicator, No. 3 being solid, and No. 4 being orthoscopic and provided with micrometer. The objectives are 3 in., 1½ in., ⅔ in., ¼ in. with Lieberkuhn, $\frac{1}{6}$ inch adjustable, dry, $\frac{1}{10}$ immersion, $\frac{1}{15}$ immersion. There is also a polariscope, wide-angled achromatic condenser, a stage micrometer and a double oblique nose piece. The price complete was $500.—*W. W. Munson, M. D., in "Report of Eastern Asylum," Pontiac, Mich.*

Microscopic Analysis of the Structure of Iron and Steel.—After briefly reviewing the work of A. Martens, of Berlin, and Dr. H. C. Sorby, of Sheffield, in this field of research, Mr. Bayles considered the methods of preparing specimens for microscopic study which in practice he had found to give the best results, and continued: The first step to be taken in practical microscopy is the training of the eye to observe what may be seen without the aid of a lens. This is accomplished by the patient examination of characteristic features, and noting similiarities and differences. After the naked eye has become familiarized with all it can see, the student should continue his investigations assisted by a hand-lens

with a power of from two to three diameters, and absolutely achromatic. Specimens to be studied with a view to determining their internal structures should be surfaced in a planer, and smoothed by draw-filing in the direction of the fibre. The surface thus obtained is treated with slightly diluted nitric acid, which gives a rapid and wide development of the structure, which may be studied with advantage while it lasts, and will prepare the student for finer work. For fine development more care and time are needed. After planing, the surface of the metal is ground with fine emery, or under a metallic mirror-grinder. It is then treated with acid, Mr. Bayles describing the manner in great detail. A thorough development with weak acid requires from twenty-four hours to six days, according to the composition of the metal. Small specimens are prepared by planing down from the back to a thickness of $\frac{1}{32}$ to $\frac{1}{16}$ of an inch. The planed face is then ground and surfaced on a fine whetstone, developed with weak acid, and mounted between glasses with Canada balsam. In selecting a microscope, care should be taken that the lenses give a good definition, that there is no 'shake' or or lateral motion in the adjustments for focus, and then the table should admit of inclination at any angle found most convenient for observation. Concerning the results to be expected from the microscopic analysis of metals Mr. Bayles expressed the belief that it opens a vast field of knowledge not yet reached by either chemical analysis or physical test. There are many conditions, the result of changes produced by mechanical treatment, to which chemical analysis gives no clew, and which are detected, but not explained, by the tests of the physical laboratory. The microscope will, no doubt, explain many of the mysterious changes which occur in metals of given chemical composition under different conditions, and will give the metallurgist an opportunity of studying the anatomy and physiology of iron and steel, which, in a most important sense, will supplement analysis and mechanical test, which have thus far, to some extent, run in parallel lines. When, between the report of analysis and the fracture of the broken test-piece, we can place a polished longitudinal or cross-section of the material, its internal structure developed by acid, and admitting of careful microscopic study we are furnished with the missing link in the chain of evidence required for a correct conclusion as to the nature of the material under investigation.

The Bacillus.—It seems to have been abundantly proven by very capable pathologists and microscopists that many of the diseases prevalent among humanity are directly attributable to a minute living organism called *bacillus*. Different diseases are supposed to be the result of different forms of this organism—in other words, every disease has its own pecular bacillus.

The disease to which sheep are subject, on the continent, known as *anthrax*, has been proven to be caused by a pecular bacillus that invades the blood and tissues of the animal. But what is still more curious, these little animals are propagated in certain fluids, such as the cerum of the blood, sound animals inoculated therefrom when the disease becomes established in the inoculated creature. These bacilli are also "cultured" by producing several generations of them, inoculating a prepared fluid in which they are found to flourish, first from the diseased animal, then a fresh fluid from the last inoculation, and so on, until the culture is several generations remote from the original bacilli.

Now, if an animal is inoculated with this last culture, it is found to produce a mild form of the disease, that protects the animal from an attack of the more virulent one, just as we vaccinate with the cow-pox to cause a mild form of varioloid exempting the subject from small-pox.

Extensive experiments have been carried on in this line, vaccinations having been made with the bacilli of scarlet fever, typhoid fever, erysipelas, diphtheria, consumption, and more recently, whooping-cough, with a view to preventing these highly contagious and dangerous diseases. As yet, experiments have been confined to animals, but we doubt not that sufficient knowledge will thus be obtained to warrant the inoculation of human beings for the prevention of the diseases enumerated, as well as for many others.

To show the results of the experiments of M. Pasteur in cultivating the bacillus of malignant charbon and inoculating sheep therewith, we have learned from the reports of the veterinary society of Eure-et-Loire, that the number of sheep vaccinated in this department was 79,312. Before vaccination the annual losses on these flocks amounted to 7,237, or about 9 per cent.; since vaccination, only 518 animals have perished, or about $\frac{65}{100}$ of one per cent. There were also vaccinated 4,652 cattle, among which the

annual loss from charbon was 322. Since vaccination but 11 cows were lost.

This already sufficiently demonstrates the value of the discovery of, and experimentation with, the bacillus, for all of which we are indebted to the microscopists.—*Editorial in The Bistoury.*

A New Binocular.—The Bausch & Lomb Optical Company, of this city, have just completed a binocular of the well-known "Investigator" pattern, which, in addition to being as nearly perfect in other respects as possible, presents improvements in the construction and adaptation of the prism, and in the nose-piece in which the prism is fixed, that deserve attention.

In the absence of cuts of this part of the instrument, which we hope to be able to produce in our next issue, those of our readers interested in this form of microscope must be content with a brief outline of the leading features of the new arrangement. These are:

1st. A very large prism with perfectly plain surfaces, cemented upon a glass disk.

2d. As this combined prism and disk is fixed by the maker, it remains in place regardless of the whim of or want of skill in the observer.

3d. The mounting of this combination is a brass nose-piece, which slides into the tube and is fastened by a new form of bayonet catch, a novel feature in itself.

4th. The monocular nose-piece is separate and is fastened in the tube in the same manner.

5th. The effect with the prism in place is quite as good in this instrument as it is in the old forms when the prism is withdrawn, as it permits the passage of light possible in objectives with the society screw.

6th. While a little more time is consumed in changing from monocular to binocular and back again than is the case in the old form, the loss is fully compensated for by the absolute accuracy of the new, which cannot get out of place.

7th. As low powers only are used in binocular instruments, a given objective may be kept in the binocular nose-piece and the higher power in the monocular, an arrangement almost as convenient as in the well-known double nose-piece.

8th. The bayonet catch above mentioned may be applied, and probably will be in the near future, to objectives as a substitute for the society screw. The fit is as good, and the time saved in changing objectives great.—*Odontographic Journal.*

Items.

Make a number of cells at a time.

Glycerine cannot be excelled as a preservative medium.

Cells made of some of the balsams and finished with the same are transparent, and look very neat.

Remember that costly and complex apparatus does not insure successful work. Good lenses with simple accessories.

Do not go to work when in a hurry. The white zinc will be too thick or your knife will be too dull.

"How high an objective is that, Mr. G.?" "It is an one-eighth immersion." "Oh! is that all. I have a two-inch immersion."

Triple and quadruple stainings are very curious and pretty, but good single, or at most double, staining, is all the histologist requires.

Nothing will throw a microscopist into a chill more quickly than to see a friend look into his microscope and *focus down* with the coarse adjustment.

It is no proof of the great skill of the operator or of the superior value of his lens, because he can resolve a test "with the microscope resting on a flour barrel and the mirror held up by a stick."

The microscope gives us better ideas of the exact condition of affairs in the examination of urine than the various chemical tests. Therefore the time has come when every true physician should know how to handle a microscope.—*Dr. Formad, Louisville Med. News.*

Bacteria in Fishes.—Oliver and Richet have examined 150 fishes of different genera and species, and find, in all cases, that there are microbes in the blood and lymph. They conclude that, contrary to what is believed to be the case in other vertebrates, microbes occur normally in the fluids of fishes.—*Comptes rendus*, 1883.

Preservation of Protozoa.—Henri Blanc recommends preserving protozoa with a mixture of 100 pts. concentrated solution of picric acid, 2 pts. sulphuric acid, and 600 pts. distilled water, with one drop of 1 per cent. acetic acid for every five centimetres of the mixture. For coloring use 5 grms. of safran dissolved in 15 grms. absolute alcohol, which is allowed to stand for a few days, and then be filtered.—*Science.*

Colors of Feathers.—In continuation of previous communications Dr. Hans Gadow discusses the colors which are not the result of pigments: blues he considers to be the result chiefly of a series of fine lines on the walls of the prism cells; greens as the result, most often, of decomposition of light from a yellow pigment; metallic feathers are considered to work on the simple principle of a prism.—*Science.*

Professor Owen, in the Proceedings of the Zoölogical Society of London for 1882, p. 571, objects to the current statement that Hilton was the first to discover the Trichina spiralis, and points out that Hilton saw only the calcified cysts in the muscles of cadavers. To Professor Owen himself properly belongs the honor of the important discovery of the parasitic worm—a discovery which has led to the prevention of so much suffering by having guided us to the means of avoiding trichinosis.—*Ex.*

Destruction of Red Blood Corpuscles in the Liver.—It has long been supposed that the red blood globules were to a great extent broken up in the liver, giving rise, among other things, to the bile pigments. The experimental proof, however, has been unsatisfactory. R. Nicolaides finds on careful enumeration, by Melassez's method, of the corpuscles in blood drawn from the portal and hepatic veins of rabbits, dogs, and cats, that the number is always much less in the hapatic vein.—*Archiv. de Physiol.*, x. 1882.

Microscopic Animals in Bricks.—The weathering of brick walls into a friable state is usually attributed to the action of heat, wet, and frost; but from recent observations of M. Parize, the real destroyer is a microscopic creature, and the action played by the weather is only secondary. He has examined the red dust of crumbling bricks under the microscope, and found it to consist largely of minute living organisms. A sample of brick dust taken

from the heart of a solid brick also showed the same animalcule, but in smaller numbers. The magnifying power of the instrument was 300 diameters. Every decaying brick showed the same kind of population, but the harder the brick the fewer were noticed.—*Ex.*

Collecting Small Organisms.—In order to procure small organisms for microscopical examination, living in their natural habitat, Professor K. Möbius fixes some glass slides in a piece of wood in which cuts, a few millimetres deep and of the thickness of the slides, had been made with a saw. The wood was nailed to a pole attached to a landing-stage in Kiel harbor, in such a way that the wood with the slides was a few feet above the sea-bottom. For the examination of the organisms on the glass slides, they were removed from the wood, and immediately fixed in a cork, and floated in a glass vessel full of sea-water.

Upon such glass slides hydroid polyps, annelids, bryozoa, infusoria, rhizopoda, diatoms, etc., attach themselves.

In the aquarium slides may be similarly suspended from corks in order to have infusoria, rhizopoda, etc., for immediate examination.—*Royal Mic. Jour.*

Bacilli in Condensed Aqueous Vapor of the Breath of Phthisical Persons.—A. Ransome condensed the aqueous vapor of the breath of persons in an advanced phthisis, by the method he invented some years ago (1869); the method of staining used was that of Heneage Gibbes, magenta and aniline being used, discharged by dilute nitric acid, and chrysoidin then added. It was found that in the aqueous vapor obtained from two persons suffering from phthisis, there was a bacillus which took the staining in the same manner as the bacillus found in phthisical sputa and in tubercle, and which is indistinguishable from that organism. In some cases the experiments were unsuccessful.—*Royal Mic. Jour.*

Mucous Layer of the Skin.—Ranvier has made sections of the human skin, hardened in bichromate of ammonia (20 per cent.) for two or three months, and then with gum and alcohol. In these the intracellular network is well shown by haematoxylin. The fibres of the network project beyond the cell and establish the union between the cells. In the intercellular spaces these fibres are thicker than within the cells: they have therefore acquired an additional envelope. Ranvier further argues against considering the

threads as protoplasm, but maintains that the clear substance in which they are embedded is the true protoplasm in all cells derived from the ectoderm. This is especially maintained for the central nervous system. (His arguments do not appear convincing.)—*Science.*

A Mode of Collecting Scales on a Slide.—This consists in putting the scales in a drop of some quickly evaporating substance—chloroform is best for most purposes—on the slide. The scales will form in a kind of whirlpool, nearly all the scales finally settling down, as the liquid evaporates, in one place on the slide. This mode of operating is very convenient; and, by inclining the slide gently, the mass of floating scales can be made to settle on the exact centre of the glass. One part of Canada balsam to several hundred of chloroform will cause them to stick to the slide.—*Science.*

On a Simple Method of Mounting Objects for Microscopical Examination.—The object is to avoid the formation of two distinct collections, the dissection on the ordinary slide being kept in one place and the insect in another. The author, therefore, uses very fine cardboard in pieces 9 lines by 6. A hole 2½ to 3 lines across is punched at one end in the centre and 1½ to 2 lines from the edge. The lower side is closed by a cover-glass, and the object mounted in balsam. The dissection can now be placed alongside the insect in the collection. The author also explains his method of preserving larvæ by the roasting process, also Aphidæ.—*Proc. Nat. Hist. Soc. Glasgow.*

Heating Apparatus.—Thoulet describes a new method of heating objects upon the stage. He has constructed a small "stove" or chamber, to rest upon the stage, and to contain the object and the thermometer. It consists of a glass tube fitting into a copper cylinder which rests upon a disk of copper, furnished with lateral prolongations, which can be heated by a gas jet. The whole is insulated by resting upon a disk of cork. The temperature of the chamber can be raised by heating the prolongations of copper, and lowered by introducing a current of fresh air through a small tube fixed in the side. Very exact measurements can be taken with this simple apparatus, which is well adapted for determining the temperature of the disappearance of bubbles in liquid infusions, for studying the formation of crystals at various temperatures, or for other micro-chemical investigation.—*Bulletin Society of Mineralogy, France.*

Reviews.

AN INTRODUCTION TO THE STUDY OF ORGANIC CHEMISTRY. By Adolph Pinner, Ph. D. Translated and revised from the fifth German edition by Peter T. Austen, Ph. D., F. C. S. New York: John Wiley & Sons, 1883. 19+ 403 p. 8°.

This work is intended to be a text-book for college students. It is systematic and comprehensive. The enormous number of substances derived from carbon furnishes abundant material for both practical and theoretical considerations. The translator has done his work clearly and satisfactorily, while the publishers have given us an unusually well printed work. As a compendium of organic chemistry it deserves general acceptance.

ESTUDIO ADMINISTRATIVO—MILITAR DE LA EXPOSICION UNIVERSAL DE PARIS de 1878. D. Augusto Munoz y Madrid. Madrid, 1880; pp. 1,000; ill. 100.

HOME HEALTH. A New Monthly Journal of Popular Hygiene. Thos. M. McIlvaine, Editor. Peoria, Ill. Price $2.00 per annum.

ON THE OCCURRENCE OF THE BACILLUS TUBERCULOSIS IN TUBERCULAR LESIONS. By T. Mitchell Prudden, M. D. Reprinted from the Medical Record, April 14, 1883; pp. 20.

RHABDOMYOMA OF THE PAROTID GLAND. By T. Mitchell Prudden, M. D. Reprinted from The American Journal of the Medical Sciences. April, 1883; pp. 5; ill. 4.

THE OPIUM HABIT; Its Successful Treatment by the Avena Sativa. By E. H. M. Sell, A. M., M. D. Pp. 32.

TRICHINÆ; Their Microscopy, Development, Death, and the Diagnosis and Treatment of Trichinosis. By W. C. W. Glazier, M. D. Pp. 20; ill. 17. Price 25 cents. Published by the Illustrated Medical Journal Co., Detroit, Mich.

THE PHYSIOLOGY OF PROTOPLASMIC MOTION. By Th. W. Engelmann, M. D., Professor of Physiology in the University of Utrecht. Translated by Chas. S. Dolley, M. D. Published by Davis & Leyden, Rochester, N. Y. Price 50 cents; pp. 40; ill. 3.

THE BACTERIA. By T. J. Burrill, Ph. D., Professor of Botany, Illinois University, Champaign, Ill. Octavo, 65 pages; paper, 50 cents. Part I—Nature and Organization of Bacteria. Part II—Effects of Bacteria. Part III—Classification of Bacteria.

STATE BOARD OF HEALTH. Michigan, 1882. Henry B. Baker, Secretary.

Y. M. C. A. HERALD. Carthage, N. Y. Edited by Prof. D. P. Stowell.

Our younger brother gives his readers a bright, clean little sheet, well written and bound to do good.

Books received and reviewed in our next issue.

United States Dispensatory. Fifteenth Edition. Wood, Remington & Sadtler. 1883. J. B. Lippincott.

On Headaches. By William Henry Day. Fourth Edition. Price 75 cents. P. Blakiston & Co. 1883.

American Medicinal Plants. By C. F. Millspaugh. Price $1.00 per number. Boericke & Tafel. New York and Philadelphia.

Alcohol. By Geo. C. Pitzer, M. D. 1883. St. Louis, Mo.

Wild Flowers, and Where They Grow. Price, $3.00. By A. B. Harris. D. Lothrop & Company. Boston.

"It is invaluable to me in half a dozen sciences, and has often paid me more than the subscription price."

The Microscope, published by Dr. Chas. H. Stowell and wife, Ann Arbor, has entered upon its third volume. It especially considers the microscope in its relation to medicine and pharmacy. The present is the best number we have seen of this excellent magazine. Every physician ought to have a microscope, and then subscribe for this journal, which is a marvel of cheapness.—*Ex.*

The Lodran Meteorite.—The microscopic and general characters of this meteorite which fell at Lodran, India, Oct. 1, 1868, were quite fully described by Tschermak in 1870 (*Sitzungsb. Akad. Wissensch. Wien*, 1870, lxi). Dr. Stan. Meunier finds, on studying a section, that it appears to be composed of bronzite, olivine, pyrrhotite, chromite, and grains of metallic iron. If, however, a chip is heated and then suddenly plunged into mercury, the silicates fall to pieces, while the metallic portion is seen to form a very fine network or sponge-like mass. This network is the same as, but finer than, that formed by the iron in the celebrated Pallas meteorite, to which this is allied. Dr. Meunier regards the Lodran meteorite as a true sandstone, having a metallic cement. The metallic portion was evidently posterior to the accumulation of the silicate grains, which must, before their cementation, have formed a true meteoric sand. He does not regard water action necessary to produce such a sand, but thinks, rather, that it was produced by volcanic action.—*Comptes Rendus*, xcv.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

FOR SALE.—One copy of Leidy's Rhizopods of North America. Price, $7.50. Address, C. H. STOWELL, Ann Arbor, Mich.

FOR SALE.—Mounts of renal tube casts and double-stained blood corpuscles. $1.00 per slide. A. Y. MOORE, 53 Prospect St., Cleveland, Ohio.

WILL exchange rubber cement for good slides. EUGENE PINCKNEY, Dixon, Ill.

FOR SALE.—Zentmeyer's American Grand with Accessories. Cost $500. Sold at a bargain. STEPHEN BOWERS, Falls City, Neb.

WILL exchange histological mounts for equally good slides. FRED. K, SMITH, Ann Arbor, Mich.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

I WILL exchange good, histological for other first class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

FOR SALE.—Two Oxy-Hydr. Projecting Microscopes—cheap. I. G. LANGGUTH, 133-135 Wabash Avenue, Chicago.

FOR SALE.—A Spencer ¼ 115° or will exchange for a wide angle ½. F. O. Jacobs, Newark, O.

THE MICROSCOPE

AND ITS RELATION TO

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Original Communications.

THE MEASUREMENT OF NUMERICAL APERTURE.

BY A. Y. MOORE.

THE amount of light which objectives would receive from their objects was for a long time expressed in degrees, as measured in air. Dry and immersion objectives were regarded alike until the angle of 180° was reached. Objectives were constantly improved, and it was soon demonstrated that immersion objectives could be constructed which would transmit more light than corresponded to the limit of aperture (180°) for dry objectives. This then gave rise to the term glass or balsam angle, and it was found that in an immersion objective the balsam angle of 82° corresponded with the air angle of 180°. Hence an immersion objective having a greater balsam aperture than 82° was said to have an aperture of "plus 180°," which, of course, is not possible, as an aperture of 180° in any medium—air or balsam—is impossible. When 180° is spoken of, it is understood to mean infinitely near 180°.

Prof. Abbe made known a system for the expression of aper-

ture, however, which prevents all this confusion. This is known as the numerical aperture. 180° in air is taken as the unit, and when an immersion objective has an angular aperture greater than 82° as measured in balsam, it is expressed as a certain amount more than this unit. By the numerical system the amount of light which passes through the back lens of the objective is considered, as compared with the focal length (magnifying power), and no attention is paid to the direction of the light as it enters the front. That is to say, with an objective of given power a certain definite acting surface must be given to the back lens, to give it an angular aperture whose numerical expression shall be 1·00—corresponding, as before stated, to 180° in air or 82° in balsam; and with an increase in the acting diameter of the back lens above what is required for the numerical value of 1·00. (The magnifying power remaining the same) the numerical value is increased accordingly.

Professor Abbe has shown that the numerical aperture may be obtained by multiplying the sine of half the angular aperture by the mean refractive index of the fluid in front of the front lens—be it air or some immersion fluid. This necessitates the correct measurement of the angular aperture; and as means for this purpose are not embodied in every microscope stand, it is sometimes, to say the least, inconvenient.

For some time past I have made use of a method which, in its practical application, I think is somewhat new. It is by accurately measuring the acting diameter of the back lens when the full aperture is in use, and also when only the numerical equivalent of 180° air is used. Then, by dividing the former by the latter, the numerical aperture is obtained. The practical operation is as follows:

A low power objective—a three or four inch is convenient for the purpose—is to be screwed to the microscope and the latter placed in a horizontal position. The objective to be measured is now to be screwed into the substage with its front from the stage, the mirror having been removed. If the microscope be properly focused, a bright circle of light will be seen, which is the acting diameter of the back lens for 180° air=N. A. 1·00. The camera should now be slipped upon the eye-piece and the diameter of this circle marked upon a piece of paper. A hemispherical lens is now to be placed in front of the objective being measured, which should have immersion contact with it. This will enlarge the bright circle

to the full aperture of the objective; and this circle also should be drawn upon the paper. The objective should then be removed, and a well ruled micrometer placed upon the stage and drawn upon the paper. The diameters of the two circles may now be obtained in the usual way of measuring objects. The measurements are best made in thousandths of an inch. If the diameter of the larger circle now be divided by that of the smaller one, the numerical aperture will be expressed by the quotient. This applies only to those objectives which have a numerical aperture of more than 1·00.

If the magnifying power of the objective be measured, by the rule of proportion the proper acting diameter of the back lens for a numerical value of 1·00 of any objective whose magnifying power is known, may be ascertained; and even though it have far less than 180° air, its numerical aperture may be obtained by dividing this theoretical diameter by the acting diameter of the back lens. The measurements of the diameters should be very accurately made, otherwise the results will vary largely from the truth. The use of the hemispherical lens is only required when the aperture of the objective is more than 1·00. From the numerical aperture, the angle in any immersion medium may be calculated by dividing the numerical aperture by the refractive index of the fluid used, which gives the sine of half the angle of aperture. The angle which corresponds to this sine may then be obtained by reference to a table of natural sines, which, after being multiplied by two, gives the angle desired.

SENSITIVE DENTINE.

BY A. M. ROSS, M. D.

ALMOST daily is the fact demonstrated in practice by the operator upon human teeth that the soft dentine immediately overlying the sound structure in the carious cavity, is, in many cases more exquisitely sensitive than the sound structure itself. The excavator or sharp engine bur may be used with more freedom and produce less pain after advancing beyond the softened structure. This is found to be true in such a large majority of cases, by the observing dentist that he is sometimes led to believe that there is an

excess of living matter at this particular point or that there is an inflammation of the living matter causing hypersensitiveness.

Few teeth having this unpleasant characteristic in a marked degree, were examined under the microscope, the specimen being usually a longitudinal slab ground from the fresh tooth and including both the soft and hard dentine, the *softest* outer portion being of course ground away in bringing the specimen to the requisite thinness. When the specimen had been reduced in thickness to about one lanima of canaliculi it was immersed for a few moments in one eighth per cent gold chloride, washed in distilled water and then placed in glycerine and 1 p. c. acetic acid which was exposed to diffuse daylight until the violet color was produced by the reduction of the gold salt; the specimen was then mounted in glycerine and distilled water, equal parts. If fresh teeth that are carious are treated in this way, many very interesting facts concerning the process of decay will be seen under the microscope, but in regard to this subject it will be found after many specimens have been prepared that there is a great difference in the density of tooth structure and that this difference is largely due to the varying size of the dentinal canaliculi. It will be found that the fibrillæ in the more dense dentine nearly or quite fill the tubuli, whereas in the tooth of very loose structure the canaliculus may be twice the diameter of the fibrilla that it contains.

The violet color spoken of by straining with gold chloride is only produced in the already softened or decayed portion, joined to the sound portion in the specimen, the outside line of this color showing definitely how far the process of decay has progressed. Just inside this line of color will be found an apparently normal amount of fibrillæ, extending across the line from the sound structure. Some of these fibers of living matter extending beyond others for some distance into the colored dentine.

[TO BE CONTINUED.]

LABORATORY WORK.

BY C. H. STOWELL.

KIDNEY.

SECTIONS of the fresh kidney may be made with a Valentin's knife, or a freezing microtome. The most instructive views are obtained only from hardened injected specimens. The kidney

of the rabbit or pig may be injected with little trouble from the renal artery. Prussian blue or carmine will give good results if only the injection be continued for some time in order that all the capillaries of the glomeruli may be completely filled. The vein may be injected at the same time. After the injection the organ should be cut into eight or ten pieces, placed in Müller's fluid, and in two or three weeks transferred to alcohol, to complete the hardening. The sections should be cleared in oil of cloves, and mounted in dammar. If desired, they can be slightly stained in hæmatoxylin before clearing.

It is quite difficult to inject the kidney from the ureter, and if the injection be a success, the specimen will not show to any great advantage; for owing to the convoluted course of the canals and their dense arrangement, it is quite impossible to trace the course of one tube for any considerable extent. The tubes may be separated by teasing, if the interstitial connective tissue be previously destroyed.

This may be accomplished in a measure by boiling in acids, or by macerating the section for 12 to 14 hours in muriatic acid, to which has been added water till the acid has ceased to smoke. It is then washed and placed in distilled water for a day, when the tubes may be isolated by careful teasing. For isolating the tubes the following method of Henle's is quite successful: Sections of fresh kidney are placed in a flask partly filled with a mixture of eight parts of common alcohol and two parts hydrochloric acid. The cork of the flask is pierced with a long glass tube. The specimen is boiled in this mixture for several hours, when the fluid is poured off and distilled water added. After seven or ten days, the pieces can be carefully teased with needles.

The epithelium of the tubes is best studied in the kidney of the mature fœtus. Small pieces are placed in a one per cent. solution of potassic bichromate for two weeks. Thin sections are washed in water, and slowly stained with carmine.

LIVER.

The usual methods are followed in studying this organ, viz.: injecting, hardening and staining. To examine the uninjected liver, small pieces are placed at once in Müller fluid and allowed to remain there for two weeks, at least. A large amount of the

fluid should be used. The pieces are then placed in dilute alcohol for a day or two, and then in alcohol of full strength for two or three days longer. Sections can be made now without trouble, and stained with hæmatoxylin. Sections should be made in at least two directions. First, parallel to the surface, in order to cut the intralobular veins across, and show the arrangement of the lobular plexus of capillaries and their relation to the liver cells. Second, vertical to this surface, showing the intralobular veins along their length, and their terminations in the sublobular vein. These vessels are seen to much better advantage in injected specimens. The liver of the rabbit or cat is especially suitable for injection. The animal should be killed by bleeding. A branch of the artery, or portal or hepatic vein, or branch of a duct may be injected, or several of these may be injected at the same time with different colored mixtures. As in the case of many of the vessels of the different organs, so here especially will it be wise to make a slit through the walls of the vessel in a longitudinal direction, and insert the pipe into this rather than into the opening of the cut end of a vessel. In this way a pipe can be inserted into a vessel scarcely larger than the pipe itself. To inject the portal vein thoroughly, first a solution of salt should be injected in order to wash out the blood.

To inject the biliary passages, the pipe of the injecting apparatus is secured in the common bile duct, and slight pressure employed. The Prussian blue mixture is satisfactory here, and as soon as a few of the lobules are seen colored by the blue, the duct should be tied, and that part of the organ placed in Müller's fluid, afterwards in spirits, and finally stained slightly with hæmatoxylin, cleared in oil of cloves, and mounted in dammar.

BRAIN.

Two methods are quite useful for examining fresh brain. Each of these methods has its advantages.

The first method will be found in full in the September number of the *Monthly Microscopical Journal*, vol. XVI, page 105, by Bevan Lewis. His method is briefly this: There are three stages of the process.

1. The preparatory stage, which consists in making as thin vertical sections as possible of the gray matter. The specimen is

held in one hand between the thumb and fingers and with a sharp razor in the other, by a sweeping cut tolerably thin sections can be obtained. The upper surface of the knife should be deeply concave and kept flooded with alcohol. These sections are floated on a slide and a few drops of Müller's fluid placed over them. This is allowed to cover them completely and to make a pool around them for some seconds. The cover glass is then applied and by aid of a pencil or strongly mounted needle, steady gentle pressure is made on the centre of the cover until the nervous matter becomes a thin transparent film. The superfluous fluid is removed by rinsing in water and the slide is then transferred to alcohol. In about thirty or forty seconds the slide is removed from the dish of alcohol and while one edge of the cover-glass is steadied by the fingers, the blade of a penknife is gradually inserted beneath the opposite edge. The thin film will be left floating on the glass-slide or adhering to the cover-glass. The specimen is washed to free it from spirit by inclining the slide and allowing drops of water from a large camel's hair brush to flow over it.

2. The staining stage. A drop of a one per cent. solution of aniline black is placed on the film and as soon as the requisite color has been acquired, the slide is transferred to a vessel containing water and gently lowered in it. By gently moving the water above it with a brush the superfluous dye floats away. Other staining agents, notably carmine, may be used.

3. The mounting stage. All fluid is drained off the specimen and it is placed under a bell jar with sulphuric acid. When perfectly dry add oil of cloves. This is removed when it has rendered the film transparent and dammar added and then the cover-glass.

The Sankey method. Another excellent method was described in the April number of the *Quarterly Microscopical Journal* of 1876. Sections are cut as by the above method, only they may be as thick as the one-tenth of an inch. They are stained in a 7 p. c. solution of aniline blue-black. In three hours the staining is removed and water added until it washes away the excess of the staining. The specimens are floated on a clean slide, allowed to drain, and then exposed to the air in a dry place for twenty-four or forty-eight hours. At the end of this time the section will be firmly dried to the glass. It is now in a condition to have its upper surface planed off with a razor or other suitable instrument, taking care not to

scrape the specimen away at any place. Dammar is added (oil of cloves not necessary) and the cover-glass applied permanently if an examination of the specimen is satisfactory. The nerve-cells usually show to good advantage by this method.

The brain may be hardened by processes recommended for the spinal cord. A 2 or 3 p. c. solution of bichromate of ammonia is a useful hardening agent. Small portions placed in Müller's fluid and then in alcohol are suitable for study.

FOREIGN BODIES ON COATED TONGUES.

TO any one not familiar with coated tongues the following may seem interesting. The subject is not quite so important as if they were in the air passages but they are curious.

Fibres of wool, linen and cotton; fibres of spiral vessels; fibres of muscle in one case eight hours after eating; starch grains; cheese mould; portions of potatoe skin; scales, moths, etc.; hairs from legs of bees; hairs from legs of spiders; pollen of various flowers; stamens of various flowers; hairs of cats, quite common; hairs of mouse once only; hairs from various leaves; wing of mosquito, once; fragments of the leaves of tobacco, of chamomile flowers, etc., etc.

A list ten times as long could be made, but *jam satis.*

W. H. B.

GLEANINGS FROM THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY FOR JUNE.

BY C. H. STOWELL.

The Utility of the Microscope in Chemistry.—The writer claims that the microscope is approaching, and in some respects surpassing, the spectroscope in chemical analysis.

The most minute traces of silica can be detected in a mineral by melting a sample of the substance with a little potassium hydrate, and dissolving it in a little water and then placing a clear drop of the solution on a slide; then add a drop of a two-per-cent. solution of sodium bicarbonate, and allow the liquid to evaporate at the ordinary temperature. Beautiful flower-form crystals will be present.

Aluminum oxide can be as readily detected as silica.

Glucina leaves large stars when a drop of a four-per-cent. solution of the glucium sulphate is evaporated on a slide.

Boracic acid, after evaporation of a two-per-cent. solution, gives a series of very small plates, hardly two mm. in diameter, which do not show any cross when magnified over eighty times.

The alkalies possess marked optic properties. Four-per-cent. solutions were made soluble in water, the sulphates being employed.

Potassium sulphate gives, at 0° of the nicol, a series of rhombic plates, not well defined; at 90° blue virus, with yellow or red spots, developed. These cannot be taken for any other alkali.

Sodium sulphate appears dull and silvery white, in hopper-shaped quadratic crystals.

A large number of other sulphates are given in the article, with characteristics of each. The above will give an idea of the nature of the work.

The Preparation of Marine Algæ.—The conclusion reached is that solutions of osmic acid and corrosive sublimate in sea-water gave good preparations, but the iodine solution was regarded as the best reagent.

A few drops of a saturated alcoholic solution of iodine, added to the sea-water, gives the desired results. The algæ remain in the solution ½—1 minute, and are then transferred directly into 50 per cent. alcohol.

Double-staining Nucleated Blood-Corpuscles, with Anilin Dyes.—The successful combinations used are the following: Rosein and anilin green; fuchsin and methylen blue; fuchsin and Bismarck brown; eosin and vesuvin; iodine green and Bismarck brown; Hoffman's violet and Bismarck brown; anilin violet and methylen blue. The green dyes were not permanent. The solutions used should be fresh.

Cobweb Micrometers.—This form of micrometer is preferred, which has both webs movable, instead of one being fixed as is usual. This saves time and promotes accuracy.

A New Form of Gastroscope.—An instrument for inspecting the interior parts of the body, as the larynx, œsophagus, stomach, intestines, bladder, etc. A small electric light is introduced into the cavity, and streams of water prevent any inconvenience from heat. The instrument can be introduced into the bottom of the stomach without difficulty.

Chlorophyll of Animals.—The author, K. Brandt, concludes that chlorophyll formed by animals is never found; that, where present, it is due to the presence of unicellular algæ, and that the animal hosts may be nourished by the assimilative power of these algæ.

Locomotion of Insects on Vertical Glass Surfaces.—A glutinous liquid is exuded from the apices of hairs which surrounds the lobes of the feet. The writer actually saw this transparent substance emitted from the ends of the hairs. In the case of insects, where there are no hairs, the adhesive material proceeds directly from the pores in the foot. The adhesion of pollen to bees appears to be similarly affected.

Mounting Legs, Etc., of Insects.—"The chief difficulty is the appearance of air-bubbles in the object after it has been mounted. To avoid this, there is a little dodge not mentioned in most books. When the leg is taken out of the turpentine, instead of placing it at once on the slide, boil it for a few moments in some balsam, kept for the purpose in another tube. While it is being boiled the air will escape, and the balsam will take its place. There will, therefore, be not nearly so much chance of air-bubbles arising when the object is mounted. Of course, this would be rather rough treatment for some objects; but with the legs of insects (especially such as *Dytiscus marginalis*) it generally answers admirably, and saves a vast deal of trouble."—*Eng. Mec.*

The Bacillus of Glanders.—Israel has succeeded in finding two forms of bacilli in glanders, and one of these he has also successively cultivated. Rabbits vaccinated with the fifth and sixth cultivations became infected and died. Post mortem examination showed in them characteristic lymphangitis, ulcers in the nose, and isolated patches in the lungs. Experiments made with pus from abscesses in living animals resulted negatively, as to cultivation in fluids and solids (Koch's preparation). Nodules resembling bacteria were found which leads to the deduction that the bacilli possessing only slight power of resistance had perished.—O. Israel, *Berlin. Klin. Wochenschr.*, No. 13, 1883.

Correspondence.

Dr. C. H. Stowell:

My Dear Friend—You say, in a card received a few days since, you wish you could fully believe in the famous Koch bugs. Well, I have been fussing at these for an indefinite time, and these are my results:

1st. Given the assumption that there are in all specimens of sputa, etc., when the blue color persists, bacillus tuberculosis. 2nd. I have since July, 1882, nearly one year, searched every case of throat, lung and nose mucous membrane inflammation that I could strike, and I respectfully submit: first, that there are bacilli and bacteria that retain the blue staining after treatment in vesuvin in a great number of these cases, and I have found them in acute nasal catarrh; second, that there is a great deal too much fanface in this "micrococcian heraldry." Please examine a few specimens in water and in glycerine. I think you will find materials for thought. I did. Yours, B.

To the Editors of The Microscope:

I have a number of slides of sections of melanotic nodules taken from the brain, liver and other portions of the body in the case of "general melanosis" which occurred recently in Ohio. I have also a limited number of slides of the skin in the same case, and would exchange them with such of your medical readers as have valuable pathological material mounted or unmounted to offer in return. These specimens—especially the sections of skin, are very valuable on account of their rarity. The subject that furnished them was a patient of Dr. Lechleider, of Greenville, Darke Co., Ohio, and subsequently of Dr. Falls, of Cincinnati, who reported the case in full in the *Cincinnati Lancet and Clinic*, November 18, 1882. A similar case is reported in *Tanner's Practice of Medicine* (p. 111).

I have also a few slides of *cystine* (cystic oxide), calculus and crystals, from the bladder of a patient of my own. Parties wishing to exchange for them will please address,

Yours Respectfully,

Frank L. James, M. D.
Prof. Chem. and Tox. St. Louis Col. of Physicians and Surgeons,
201 *North Sixth Street, St. Louis, Mo.*

Editorial Department.

WE regret our inability to furnish our readers with more news concerning the meeting of the American Society this month. When collecting material for our June issue we wrote a number of letters to those who ought to be most deeply interested in this meeting, asking for information concerning it. Only one letter was answered, and that was about two weeks after the June issue was mailed. We have tried and have failed. However, this would neither keep us away from the meeting nor make us sick. President McCalla will vouch for the statement that last fall it was our intention to be present at the Chicago meeting. We announced our subject and sent to Paris for a new improved instrument to complete our researches. (See our article in recent issue on Malassez's Compte-Globules). The instrument came, and also sickness. We have not been able to look into a microscope since the 10th of December last. Therefore we wish it distinctly understood—in justice to both the editors of this journal—it is by the direct command of our friends and physicians that we remain in this cool, quiet part of our state, free from care and labor of any kind, until the opening of the new college year, when we hope for a complete return of health and strength. A happy, glorious success to our Chicago meeting.

BY the advice of friends we left the southern part of this state for the cool, bracing air of its northern cities. Two very desirable routes were before us. We could take the old reliable Detroit and Milwaukee R. R. to Grand Rapids and then by the Grand Rapids and Indiana road speed away for the north; or we could get aboard of the most elegant steamer on the lakes, the "City of Cleveland," and there, with plenty to eat and neat quarters, while away the hours until our genial captain says "this is Petoskey." We are under obligations to the accommodating passenger agent, Mr. C. D. Whitcomb, of Detroit, for special favors. While away from our home our tried friend, Dr. Hendricks, will look after the mailing of our journal as well as many other things. It does certainly take sickness to find out who ones friends are.

OUR attention was called, some four weeks ago, for the first time, to the new price list of R. & J. Beck. This was found necessary "in consequence of the continued advance in cost of manufacture and the costly improvements added to certain of our microscopes, which have been sold at exceptionally low prices." While the reputation of this house is so well established that they will not suffer from this advance, yet upon general principles we regret the change. There is a large class of professional men who are almost ready to purchase a microscope and try the experiment of ascertaining its practical value. This class will not pay much for what they deem an experiment, hence, it appears to us that any advance in prices will only prolong the day when a microscope will form a necessary part of the professional man's outfit. On the other hand, however, it can be truly said that as our reputation increases, so can our prices be safely raised.

AN INTERESTING LETTER.

Profesor Lew. R. Stowell:

MADAM—I send you Box contaning peace of Brood comb, which contains Fowl brood the Crypococcus Alveaviolus said to be a minut fungus invizibel to the naked eye.

Will you give it an examinashun with your microscope and tell me if there is a fungus it is verry contagios but affects the seal Brood. report through P. O Yours.

N. P———.

THE object of a department for Reviews is to keep our readers aware of new books as they are given to the public and also to give them our own opinion concerning the real value and merit of said works. A long review is seldom read but once, and that once by the proof-reader. Our reviews will always be short and to the point, and so far as our abilities permit, they will be reliable. The only way to keep abreast of the times is to take a few journals and buy carefully selected books.

WE noticed a good editorial in a Chicago paper a few days ago on "Chicago and Microscopy." It read as if our friend, B. W. Thomas, was the writer. It certainly was a good start for the Chicago meeting.

WE desire to call attention to the new diatom test plates of Müller, mounted in monobromide of naphthaline, giving greatly increased ease of resolution, with wide-angle homogeneous immersion lenses; also to a new rack-box of pasteboard, finely finished, with folding lid and sliding cover over all, and cloth bound corners. This will retail for only twenty-five or thirty cents, and will surely meet with popular favor. For sale by James W. Queen & Co.

DR. C. T. MITCHELL, of Canandaigua, sends us an interesting account of a large soiree given by the microscopical society of that city. A number of persons from Rochester, Elmira, Auburn and Syracuse assisted the home club. These are exceedingly interesting and profitable occasions.

AMONG the new things advertised in this number we would call attention to the staining fluids and mounting media offered by the Cheyney Optical Co. They make a specialty of these and their new normal stands.

BY the United States postal laws we are not required to discontinue any subscription until all back dues are paid. We shall, therefore, expect a remittance of twenty-five cents for each copy received by those ordering their journal discontinued.

THE invitations to the second annual soiree of the Elmira Society are about as neat and tasty as anything we have ever seen. Perhaps Dr. Up de Graff will send you one.

The *Medical News* thinks "That Koch is rather too dogmatic and self asserting and speaks with rather more than the amount of confidence which characterizes a properly balanced scientific mind, whose only object is to establish truth, and not a theory or opinion of his own. On the other hand, it must be admitted that none of the critics have repeated his experiments with the care and exhaustiveness which he has used."

Selections.

ATMOSPHERIC DUST AND GERMS.

ATMOSPHERIC dust and germs have been the subject of a profound study for the last few years at the Observatory of Montsouris, and the results obtained have recently been communicated to the Faculty of Medicine, of Paris, by Mr. P. Miquel, chief of the micrographic service of the former institution.

Mr. Miquel did his collecting with an aeroscope (Fig. 1) in-

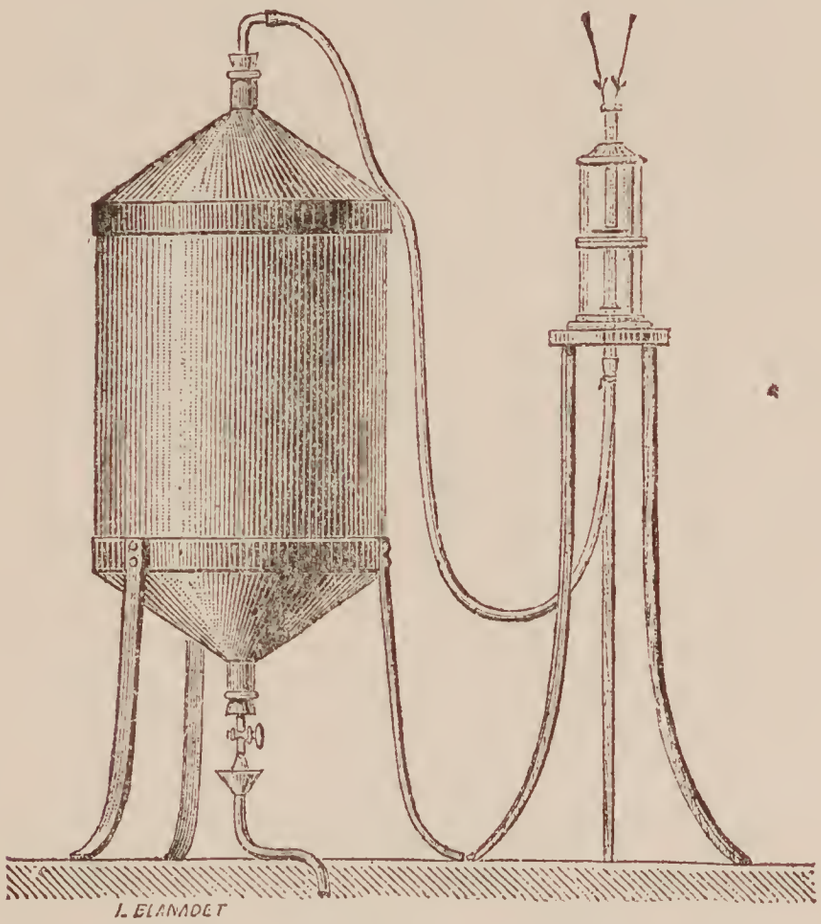


FIG. 1.

vented by Mr. F. A. Pouchet. This apparatus consists of a cylinder of small diameter connected with an aspirator, and provided with a plate of glass covered with glycerine for receiving and retaining the minute bodies carried along by the current of air.

The number and variety of the spores that are disseminated by the air is found to be immense (Figs. 2, 3 and 4). The spores of *Penicillium* and the cells of *Protococcus* and *Chlorococcus* are almost always present in great abundance. Mr. Miquel applied himself at

the outset to the counting of these organisms, and to estimating the number that existed in each cubic meter of air, and thus succeeded in determining what influence the seasons, temperature, dryness and moisture had upon their development. The results are as follows: The number of spores belonging to moulds is small in January and February, very small in March, increases in April and May, reaches

FIG. 2.

its maximum in June, and finds its minimum in December. The number of such spores per cubic meter of air was found to be, on an average:

January	7,000
February	7,000
May	12,000
June	35,000

August	23,000
October	14,000
November	8,000
December	7,000

Heat is not the most important factor in the development of these bodies, but the hygrometric state of the air is. This was to be foreseen as a deduction from the researches made on this subject by Mr. Pasteur. Storms are always followed by an increase in the number of cryptogamic germs; but mineral dust and a few species of microbes, on the contrary, remain fixed to the soil through dampness.

The exact determination of the peculiar vegetations for which the atmosphere serves as a vehicle is made through cultures—the air or water containing the organisms being made to pass into liquors favorable to their nutrition. The liquors used for this pur-

FIG. 3.

pose are the mineral solutions of Pasteur and Cohn, infusion of hay and beet, neutral urine, beef or chicken broth, and Liebig's extract of beef. The difficulty consists in having these solutions absolutely free from all living organisms. Recourse has been had, without success, to ebullition at 100°—a temperature sufficient to coagulate protoplasm, the physical basis of life, according to Prof. Huxley. Certain spores, however, resist the action of boiling water for several hours.

Mr. Koch extols the method of discontinuous heating for sterilizing liquors. He raises the latter to a temperature lower than 70° in order to kill the adult bacteria, and then allows them to cool so as to give the spores time to germinate, and finally raises the tempera-

ture again in order to kill them. Mr. Miquel, however, formally attacks this method, as he considers it inefficacious, owing to the uncertainty that exists in regard to the exact period of evolution of certain germs. He also recommends operators not to rely upon the limpidity of the liquors as a test of their sterilization; for there are liquors, Cohn's for example, which are not deprived of active germs after an ebullition of four hours at a temperature of 100°.

FIG. 4.

It results from experiments that have been made that beef broth, neutralized by potassa and kept for two hours at a temperature of 110° in closed vessels, remains indefinitely sterile. Sometimes, a temperature of 150° ought to be reached or even exceeded,

for Mr. Miquel has characterized a bacterium which resisted a temperature of 145° for two hours.

Yet heat offers one drawback, and that is that itweakens the nutritive properties of the organic liquids. An effort has therefore been made to dispense with it and to substitute for it a filtration through porous substances. For this purpose Mr. Miquel has used at Montsouris the apparatus shown in Fig. 5. This consists of a glass bulb, *b*, with a long neck, *t*, having a lateral tubulure, *p*, and being surmounted with a funnel, *e*.

Plaster and asbestos having been placed in the funnel, the bulb is raised to a high temperature in a stove, and sterilized water is then introduced through the tubulure, *p*, and raised to the boiling point.

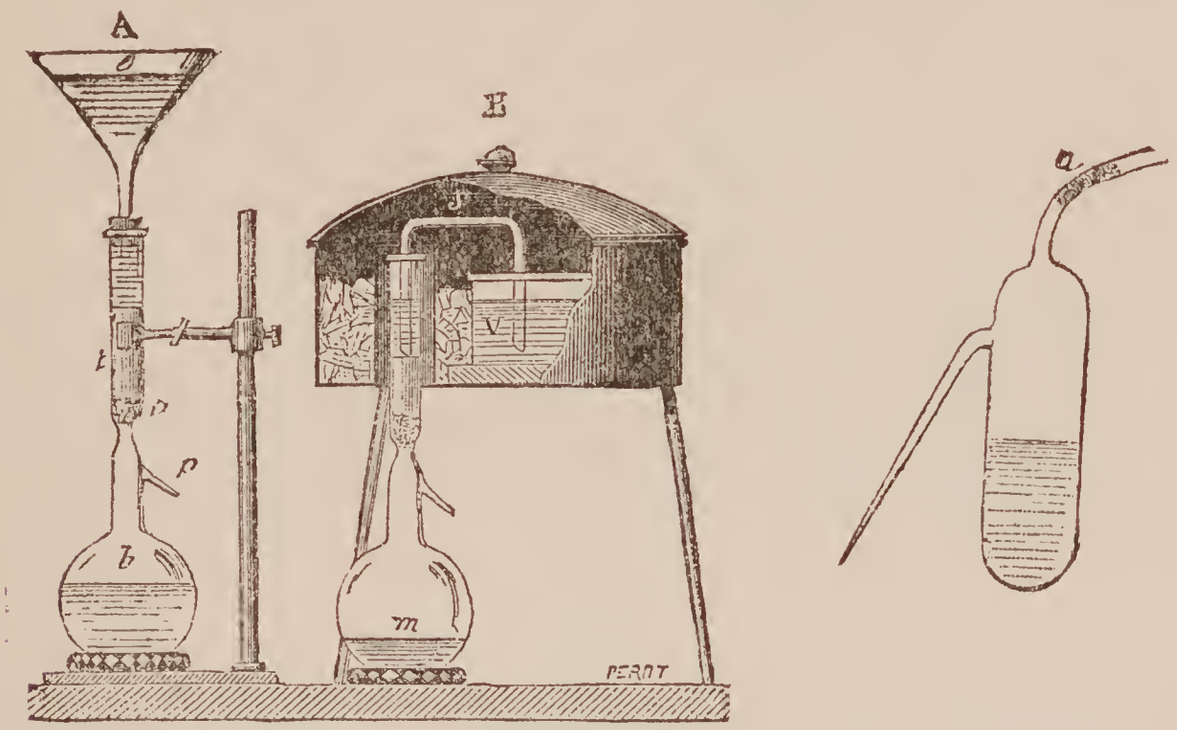


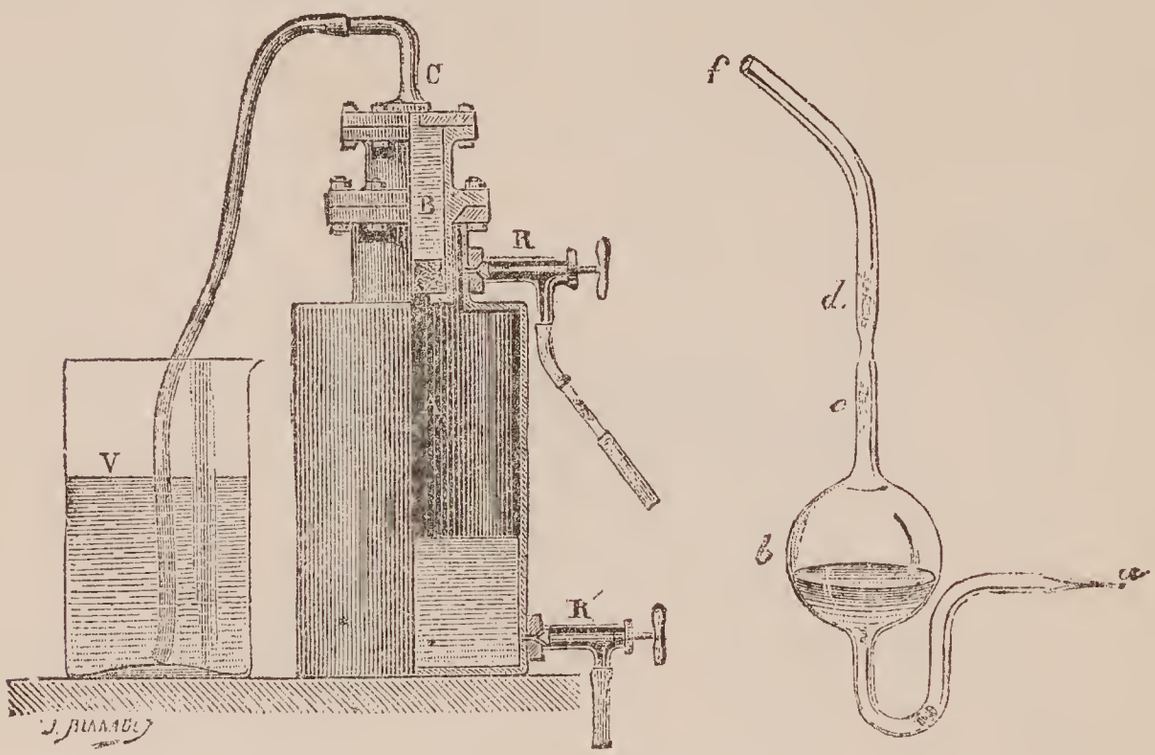
FIG. 5.

Before the water has entirely disappeared the tubulure is closed by means of a blowpipe, and, when a cooling occurs, a vacuum is produced in the bulb. The broth, being poured in a cold state over the mixture of plaster and asbestos, filters slowly through it, deposits its germs therein, and enters the bulb absolutely devoid of organisms.

During summer, in order to prevent putrefaction, the funnel and vessel, V (Fig. 6), are surrounded with ice. This cold process succeeds better than any other tending to the same end.

The sowing of atmospheric germs in nutritive liquids is done by means of special matrasses resembling in form those used by Mr.

Pasteur. The culture liquid is introduced into these through suction, then the slender extremity is closed by melting it in a lamp, and finally the liquid is sterilized by heat. In order to make sure that no atmospheric germ has got into the bulbs while being filled, the latter are tested by allowing them to remain for a month in a stove at a temperature of 30°–35°. If they do not become turbid, they are considered as adapted for the sowing. This latter is effected in different ways. If it concerns rain water, the latter is collected in the collector, P., of a rain gauge (Fig. 8.) This col-



FIGS. 6 and 7.

lector is carried by a movable arm, so that the operator placed at a distance can take it and put it very gently under the funnel, E, of the apparatus.

Mr. Miquel has applied this arrangement to the estimation of the number of bacteria contained in rain-water, and has thus ascertained that at the beginning of storms such water contains fifty of these organisms to the cubic centimeter, and that this number soon begins to diminish, although it increases again at times at the end of a few days of damp and rainy weather. It seems then, that bacteria are capable of multiplying in the clouds, or that the latter become charged with them mechanically during their travel through space. At Montsouris, out of 100 bacteria contained in a drop of rain-water, there were, on an average, 28 *Micrococci*, 63 *Bacilli*, and

9 *Bacteria*. In the air the proportion was 66 *Micrococci*, 13 *Bacilli*, and 21 *Bacteria*.

The development of these little organisms in sown liquors is followed under the microscope by means of the *moist chamber*, an invention of Messrs. Van Tieghem & Lemonnier. This apparatus (Fig. 9) consists of a hollow glass cylinder, H, at the bottom of

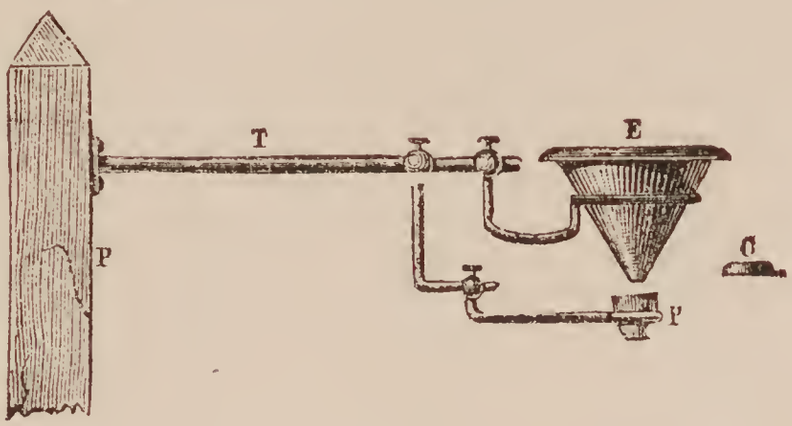


FIG. 8.

which there is placed a little water, which is afterwards covered with a thin piece of glass, LL. To the under surface of this latter is attached the culture liquid containing the spore that is to germinate therein, both being introduced by means of the rod, T. The moist chamber is placed on the stage, PP, of the microscope, under

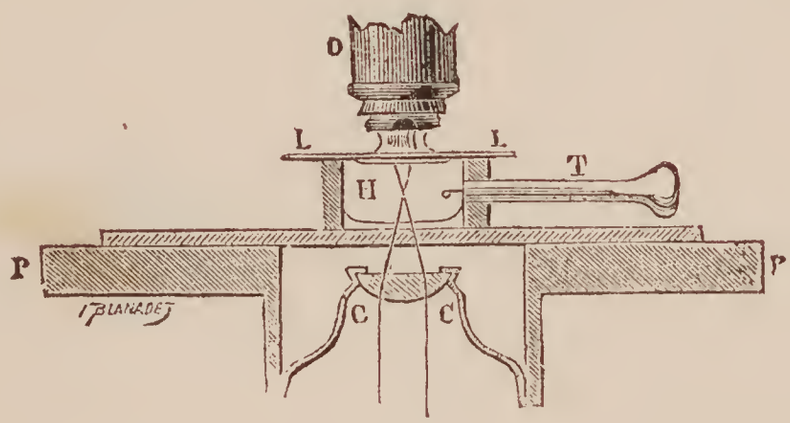


FIG. 9.

the objective, O. Mr. Miquel has in this way studied the evolutions of a bacillus, which afterward became transformed into a micrococcus (Fig. 10). He has also shown the phenomenon of the devulcanization of India-rubber, through a bacterium which is very frequent in sewage waters. This schizophyte furnishes nascent

hydrogen, and, in the presence of sulphur, gives hydro-sulphuric acid. Introduced with the ferment of urea into a solution of urea, into which dip sulphureted papers, it gives hydro-sulphate of ammonia.

The methods that we have just described have given very interesting results, and have shown that there exist, on an average, 80 bacteria to the cubic meter of air. The maximum occurs in

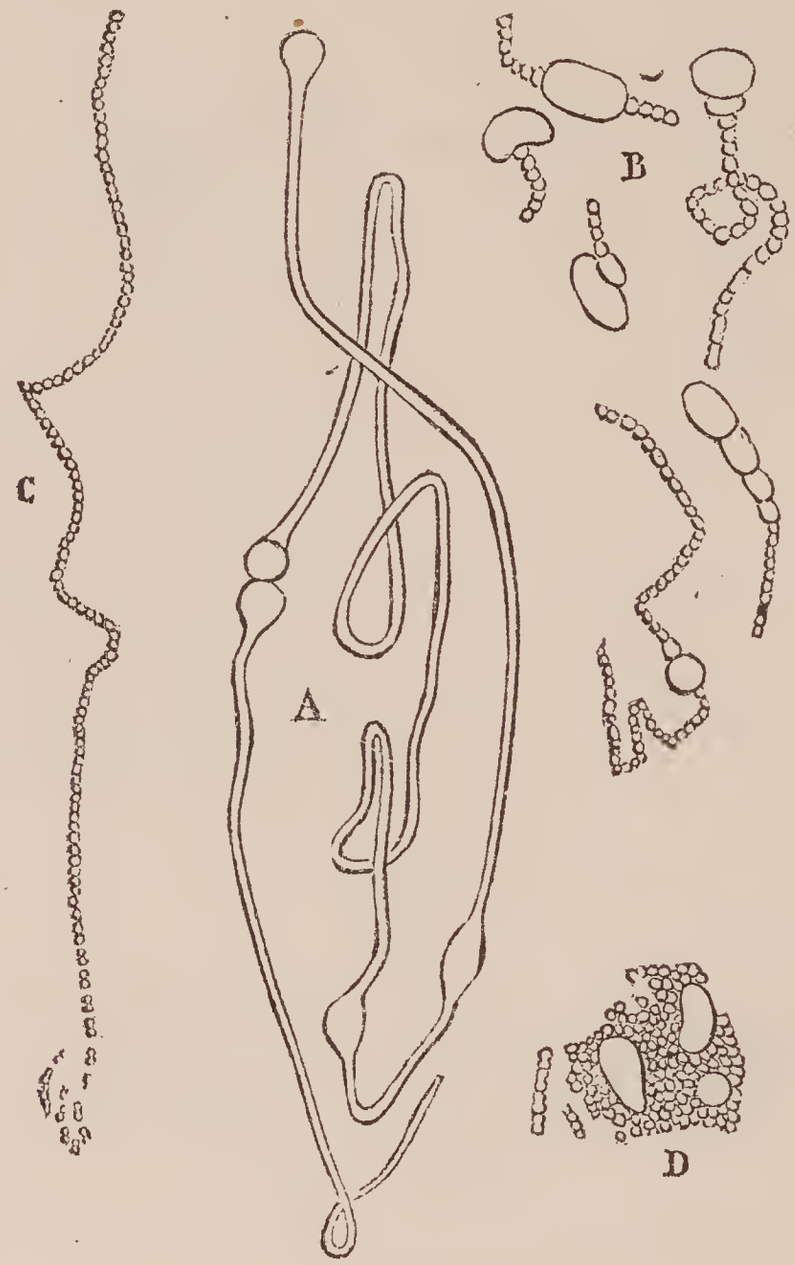


FIG. 10.

autumn, and the minimum in winter. The average numbers are as follows:

December and January	50	bacteria.
February	33	"
May	150	"
June	50	"
October	170	"

Contrary to what occurs in moulds, the number of schizophytes, which is small during rainy weather, rises when all the dampness has disappeared from the surface of the soil. The action of dryness is greater than that of the temperature. It seems, in fact, as a result of numerous experiments, that the water evaporated from the surface of the soil never carries schizophytes with it. Dry dust, on the contrary, that from hospitals principally, is charged with microbes. As a result of comparative experiments made in Rue Rivoli, and at Montsouris, it appears that the air contains nine times as many bacteria in the interior of Paris as in the vicinity of the fortifications. The influence of the dominant winds is notable.

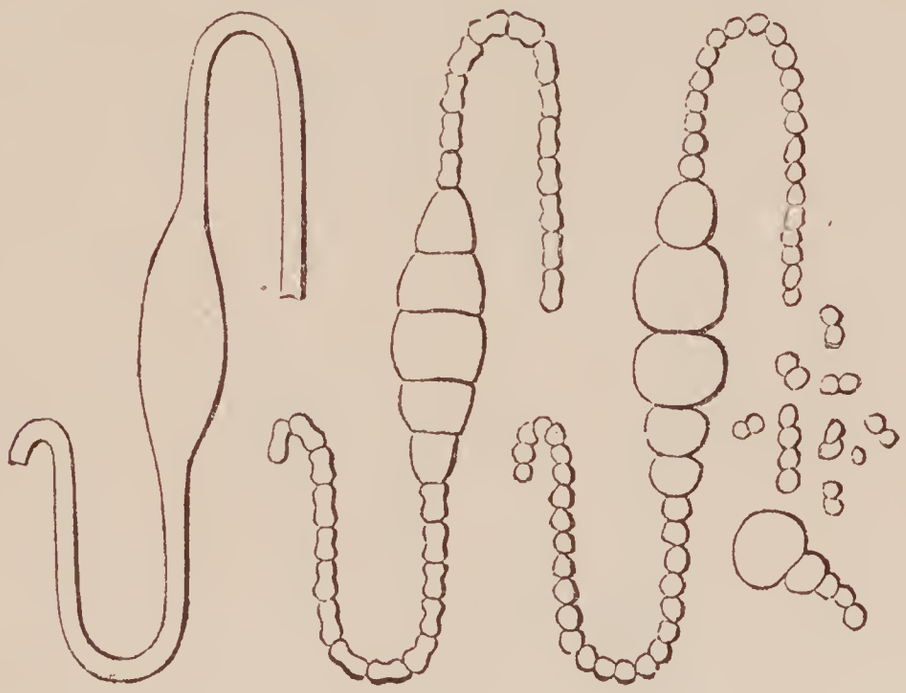


FIG. 11.

That from the northwest reaches Montsouris laden with a considerable number of bacteria. This is the wind that blows from the hills of La Villette and Belleville. Then come the winds from the east, north, and northwest. The south wind is less charged with these organisms. The distribution of microbes in a vertical direction indicates that they are derived from the mud and dirt of the streets and dwellings. A cubic meter of air, which contains but 28 of them at the summit of the Pantheon, contains 45 at the Park Montsouris and 462 at the Mayoralty of the fourth ward.

The determination, among these myriads of schizophytes of the air and water, as to which are the ones that intervene in contagious diseases is the final problem proposed to science, and the solution of which will be greatly aided by the work that is being done at the observatory under consideration.—*The Scientific American from Le Genie Civil.*

"PEAR GRIT" AS A CAUSE OF ANAL IRRITATION.

BY DR. J. T. ROTHROCK, PHILADELPHIA.

FOR three successive summers my attention has been called to a case for which I can find no exact parallel in our medical literature, and as it presents some marked features, is, perhaps, worthy to place before the medical public; especially as the diagnosis is easy, the treatment merely abstinence from the offending cause, and because, further, it may give a clue to many other cases with like symptoms.

The patient, a middle-aged, strong, active man, very fond of fruit, each summer was taken with what he first supposed a "fit of piles." There was excessive pain on defecation, tenesmus, flattened feces, and a more or less copious discharge of blood At one time the pain was so severe and so distinctly localized as to lead to the suspicion of fissure or ulcer of the anus.

The periodical return of these attacks was suggestive, and induced an examination for cause.

Among the fruits quite too freely indulged in by the sufferer were pears. This at once suggested the inquiry as to whether the "grit" that all, even the best pears, contained, might not have to do with the trouble. On mention being made, it at once brought to mind the fact that on the paper used in the closet there were small white hard bodies, never larger than the head of a pin.

Examination by the microscope revealed the fact that in the feces there were quantities of bodies like those shown in the figure —clearly the so-called sclerenchyma, or stone cells, of vegetable histologists. This furnished the clue to the treatment, which was simply to abstain from the pears, a cure always following.

An idea of the hardness of these cells may be gained from the statement that they are of exactly the same material and hardness as the shell of the hickory nut.

One may readily understand from this, and from the numerous sharp angles a cluster of these cells show, that lodged in the folds of the mucous membrane at the verge of the anus, even if it were not in an inflamed condition, it would speedily become so, and that to an inflamed or ulcerated membrane it would soon prove an intolerable source of distress.

There is this further consideration in connection with other like

cases: may they not be caused by similar substances? Does any one, for example, know whether the sharp-faced crystals of calcium oxalate which are found so abundantly in rhubarb, are dissolved in passing through the alimentary canal? We do know that rhubarb is reckoned among the predisposing, if not actually exciting causes of hæmorrhoids.

(*Barker.*)

"PEAR GRITS" *i. e.*, STONE OR SCLERENCHYMA CELLS FROM THE PEAR. CLUSTERS MAGNIFIED ABOUT 200 DIAMETERS.

The subject is especially commended to the attention of the profession in the country, where observation in this direction will doubtless show that the case above instanced is by no means a solitary one.

I am indebted to my friend and pupil, Thomas Ridgway Barker, for the illustration which accompanies this article.—*Medical and Surgical Reporter.*

GERMS AND EPIDEMICS.*—After a brief historical sketch showing the idea that certain diseases, and especially marsh fevers and the plague, are caused by the entrance of minute living organisms into the body, to be a very old one, but one which, until within a few years, has had no experimental proof, some definitions were given of the terms now used in discussion of this subject; and the word 'microdeme,' 'meaning little living thing,' was proposed as a general designation for the minute living particles found in almost all air or water. The microdemes include the *Microphytes*, or minute vegetable organisms, and the *Microzoa*—the microzomes, the bacteria, microbia, micrococci, etc. There is at present no evidence that any microdemes are derived from any source other than other living organisms, nor that the special microphytes which cause the various processes known as fermentations or putrefactions ever develop into the higher forms of fungi; although this is still an unsettled question, and there is some reason to think that some of the higher fungi may act as ferments.

The prevailing opinion at present is, that there are many different kinds of microphytes, each having special powers, and that each can only propagate its own kind within a certain limited time.

But it is also probable, that by changes in nutriment, temperature, etc., changes in their habits and powers may be produced through natural selection. These changes are so considerable as to cause them to appear to be new species. The germ theory is, that certain diseases are due to the presence and propagation in the system of minute organisms which have no part in its natural economy. The word 'germ,' however, is often erroneously applied to independent organisms which originate outside of the body itself, such as the particles in vaccine lymph which are not microphytes, and can hardly be called independent organisms.

The diseases caused by large and comparatively well-known organisms are called parasitic. Such are some varieties of skin disease; as ring-worm, or the so-called live-spots, the fungus root of India, and the disease of the ear due to the growth of a peculiar Aspergillus. A new disease of this kind is the so-called actinomycosis, due to a fungus which forms tumors near the angle of the jaw, and which causes death when it becomes generalized.

*Abstract of a lecture by Dr. J. S. Billings, given in the Saturday course at the United States national museum, Washington, Feb. 17.

An account was then given of the organisms found in splenic fever, relapsing fever, chicken cholera, leprosy, etc., and the method of Pasteur for the so-called attenuation of virus was described. This method appears to depend largely on the exposure of the broods of micro-organisms to the influence of oxygen; and recently MM. Nocard and Mollereau have announced that the same can be effected much more rapidly by the use of oxygenated water. The question as to whether Pasteur's inoculation with artificially modified virus will afford permanent protection is still unsettled, for sufficient time has not elapsed to decide it; but there is reason to hope that it will be found to be of great practical benefit.

The effects of microdemes in producing pyæmia and puerperal fever are well described, and attributed to a poison secreted by them, of the nature of the so-called ptomaines, rather than to their mere mechanical presence. This knowledge is practically applied in what is called antiseptic surgery; and the surgeon now undertakes, without hesitation, operations which, twenty years ago, would have been deemed quite unjustifiable; for he knows, that by insuring that neither through the air nor the water, the sponges nor the instruments, nor in any other way, a single microdeme which has not had its powers of growth and reproduction totally destroyed shall gain admission to the wound, he need have no fear of blood-poisoning.

As regards diphtheria, it is probable that it is due to a common micro-organism, which, under circumstances not yet understood, becomes virulent, as the micro-organisms of common sweet hay infusion may be transformed into those which cause malignant pustule.

The connection of consumption with the microphyte is still doubtful, though not improbable; and the same may be said with regard to malaria.

A sketch was then given of some of the characteristic phenomena attending the great epidemics. For some, the germ theory appears to afford the best explanation; for others, such as influenza or cerebro-spinal fever, this theory is quite inadequate.

Special attention was called to the many points in which our knowledge of these subjects is still fragmentary and imperfect—points which are to be settled by direct experiment. Such experimental researches are of the highest value; and it is much to be

regretted, that while the governments of England, France, and Germany, are employing their leading scientific men in such work, Congress has deliberately stopped a most promising series of investigation of this kind, and has resolved to confine its efforts to paying bills after an epidemic has made its appearance.—*Science.*

Are Trichinæ Killed by Salt?—The prohibition of the importation of American pork by the German Government, on account of the alleged presence of the microscopic worm known as trichinæ, has awakened a large degree of interest among pork raisers and shippers in this country. That trichinæ are sometimes found in pork (and in some other food flesh) is not to be doubted. That proper cooking of meats for food destroys them is unquestionable. That all authenticated cases of injury to health arising from the presence of this microscopic worm were traced to the eating of uncooked or half-raw meat is a fact. But that the salting of meat destroyed the parasite is still a matter of doubt, or, at least, it is a subject of dispute.

On this point United States Consul John Wilson, stationed at Brussels, makes some statements, based on his own observations. He says:

"I have myself been present when officially appointed microscopists at some of the abattoirs of this country have been engaged in examining American pork for trichinæ, and have been invited by these gentlemen to see for myself, through their microscopes, the peculiar cell and spiral coil of the animal; but, on carefully examining them, I have only observed, blended with the tissue and minute salt crystals, the entombed animal, evidently as destitute of life as the structure in which it was embedded.

"It is claimed by most trichinic observers that the process of generation and birth of this little animal invariably takes place in the stomach and intestinal canal, and that within a few days from its birth it has so matured as to penetrate the walls of the intestines and rapidly make its way through the various intervening structures to the remote muscular tissue of the animal it infects, there to be speedily encysted and endowed with a subsequent dormant existence of several years, during which time its presence occasions little or no inconvenience. Of this theory of the life and movements of this

little worm I can only say that it involves an almost unparalleled exception to the law generally regarded as determining animal life, and ought not to be accepted but upon the most positive proof. The law governing parasitic existence in living tissue usually involves the speedy death of the parasite after the pabulum upon which it feeds has passed from under the domain of vital force; hence, unless this tiny worm constitutes an exception to this law, its life must be short after the organic structure upon which it feeds has ceased to live."

Consul Wilson very pertinently adds that "if salt really kills trichinæ, and of it I have scarcely a doubt, it is evidently an injustice on the part of foreign governments to lay an embargo on our pork product, which, of all others, in order to secure it against decomposition on a long voyage to foreign markets, is better salted than that of any other country."—*Scientific American.*

The Structure of the Small Intestine.—A histological discovery, which at first sight appears sufficiently remarkable, has just been made in the small intestine by Professor von Thanhoffer. It has been found that structures almost exactly similar to the taste, organs of the tongue are disposed amongst the villi of the alimentary canal; but what function can possibly be possessed by "taste organs" in such a situation is, of course, perfectly obscure (*Centralblatt f. d. Med. Wiss.*, January 20). The discovery of these bodies is entirely a matter of careful preparation and examination, osmic acid and chloride of gold being the most favorable reägents. The appearance of the organ is that of a bowl or bud, lying, as a rule, at the base of the villi, where they are mutually connected; but occasionally they are found rather higher, or even close to the summit of the villus. Just like the taste-corpuscles, these structures vary considerably in actual size and in the relation of their height to their circumference. Their general appearance is readily described; they consist of two layers of epithelial cells—the one external, serving as a covering; the other layer internal, constituting the special organ. The latter are prolonged at their free extremity in the direction of a pore which lies at the apex of the bud, and some of them possess a short hair-like process. The actual connection of these peculiar organs with nerves has not yet been traced.—*Med. Times and Gazette.*

Items.

Mr. J. D. Möller offers for sale a "type plate" of 1,600 arranged diatoms. Price £80. Also a plate of 400 diatoms with the names of each photograph beneath.

Professor to Raw Student: "Where is the glottis?" "I don't know, sir. I think you put it on the shelf in the dissecting-room with the rest of your surgical instruments."

The daughter of Claud Bernard converted her entire courtyard, garden, parlor, and even bed-rooms into an immense kennel for the care of destitute dogs. She hoped thus to make some reparation for the miseries inflicted by the great physiologist upon the canine race.

Bacillus.—The Emperor of Germany recently requested Koch to show him a bacillus tuberculi, and Koch showed him a something which the Emperor could not dispute was a bacillus. Had it been a maggot his Imperial Highness would scarcely have known the difference.—*Mich. Med. News.*

The Micrococcus of Cerebro-Spinal Meningitis.—Herr Leyden demonstrated this micrococcus before the Berlin Society for "Medicine," on February 19 (*Medical Press*, April 2, 1883). He concludes that there can no longer be any doubt as to the parasitic nature of the cerebro-spinal meningitis. He has found in the exudation liquid of meningitis the same cocci as had been met with in pneumonia, and he has likewise proved the existence of the cocci in a case of pyocephalus.

Says the *Farmers' Magazine:* over 300,000,000 pounds of oleomargarine was thrust upon the people the past twelve months, and yet butter did not fall a cent in price, although this vast quantity directly supplied the place of so much butter in the market. Curiously, too, our supply of butter was as large as usual, and promises, owing to the rapid multiplication of creameries, to be larger, while the supply of oleomargarine will be doubled the coming year.

An insect exhibition is to be held in Paris this year from July 1 for just three weeks, under the auspices of the Central Society of

Agriculture and Insectology. It will include (1) useful insects; (2) their products, raw, and in the first transformations; (3) apparatus and instruments used in the preparation of these products; (4) injurious insects and the various processes for destroying them; (5) everything relating to insectology.—*Scientific American.*

"How long will it take you to cure me, doctor?" "Well, Mr. Blank, I think you may be able to get back to your desk in about a month, but it will be necessary for you to remain under treatment for several years." "But you evidently mistake; I am not Blank, the banker, but Blank, the letter carrier." "Ah, that alters the case. There is nothing the matter with you but a little biliousness. You will be all right in a few days."

The Future of Pasteur's Germ Theory.—*Customer.*—"My nephew is just starting for Sierra Leone, and I thought I could not make him a more useful present than a dose of your best yellow fever. Would you tell me the price, please?"

Chemist.—"Well ma'am, the germs are so difficult to cultivate in Europe that I would advise your waiting for the next West India mail, when I am expecting a nice, fresh supply from St. Thomas. Meanwhile we would advise our half-guinea traveling assortment of the six commonest zymotics, and could add most of the tropical diseases from stock, at five shillings each. We have some nice Asiatic cholera just ripe, but they are more expensive."—*Punch.*

A death is just reported in Philadelphia, of a child, from eating candy loaded with "Georgia Clay." There seems no use of longer warning parents against candies. They are made of *clay*, *arsenic* and *glucose*. There is nothing but *death* in the cheap candies now in the American market. Glucose, or corn sugar, gives them sweetness; clay and white earths form the body of the candy, while arsenic and other deadly poisons are used to give color. *These are known facts.* Not one of the ingredients named but is injurous to adults. What are they to children?—*Science and Health.*

The Little Busy Bee.—The bee has long been a type of the industrious worker, but there are few people who know how much labor the sweet hoard of the hive represents. Each head of clover contains about sixty distinct flower tubes, each of which contains a portion of sugar not exceeding the five-hundredth part of a grain.

Some patient apiarian enthusiast, who has watched their movements, concludes that the proboscis of the bee must, therefore, be inserted into 500 clover tubes before one grain of sugar can be obtained. There are 7,000 grains in a pound, and as honey contains three-fourths of its weight of dry sugar, each pound of honey represents 2,500,000 clover tubes sucked by bees.

Detection of Inks.—If a forger has used a different ink to that used by the original writer of the document, his error can be made manifest by the following manner: Get nine ½ or 1 oz. vials and fill separately, with (1) dilute sulphuric acid; (2) concentrated muriatic acid; (3) dilute nitric acid; (4) solution of sulphurous acid; (5) solution of caustic soda; (6) concentrated solution of oxalic acid; (7) solution of chloride of lime; (8) solution of tin crystals; (9) solution of proto-chloride of tin. Take nine quill pens, each one for its particular reagent. Now, with a rule, draw lines crossing original and suspected portions; the difference will show itself at a glance.—*Am. Chem. Rev.*

The Blue Color of Milk.—Herr Hansen, an authority in such matters, explains in a recent foreign scientific journal, the cause of the blue color of milk. He has discovered in milk which has become blue, a peculiar microscopical organism, known as bacteria, which multiplies with very great rapidity, and in so doing produces a peculiar blue matter similar to aniline. Milk which is kept in such a manner as to prevent the access of these organisms does not become blue. In view of these facts, it is evident that blue milk is unfit for food; and, although it may be taken with apparent impunity by adults with vigorous digestive powers, it should never be given to children, whose weaker stomachs would be unable to resist the tendency which such milk possesses.—*The Household.*

Banqueting a Microscopist.—Prof. Joseph Leidy, the great microscopist, during a visit to Charleston, last winter, was given a reception and banquet by the prominent citizens of that city. Among the good things served upon that occasion was a peculiar fish, that always carries a tumor-like excrescence upon its tail. This rotundity is regarded by the natives as a great delicacy, so that the tails only of the fish that carry it are cooked and eaten. The Professor, not exactly pleased with the appearance of this delicate

morsel, concluded to ascertain, on the following day, what his generous hosts were feeding him. He accordingly called at a fish market, selected a fish with a fine, fat tumor on his tail, and opened it. And what think you these Charleston seekers after delicacies had been banqueting on? Of course you cannot guess, but we have the Professor's word for it, the delicate morsel—the lump—contained a tape worm.—*Bistoury.*

New Parasites.—The *Mississippi Valley Medical Monthly* quotes, "from the editorial columns of a daily paper," that a Dr. Buhl, of Wisconsin, claims that he has discovered a vegetable parasite which infests the human trousers and causes broken legs. He has placed garments, cut after the manner of trousers and inoculated with the parasite in question, upon the fore legs of eighteen cats, thirteen of whom were afterwards found in a steel trap, set for the purpose in the doctor's back yard, each with a fore leg broken. Dr. Buhl maintains that by inoculating human trousers with this parasite, after it has been artificially bred in trousers supplied for the purpose to cattle, men will be fully protected against broken legs. The parasitic origin of all the ills and inconveniences known to mortals, will, it is presumed, be fully proven before many years.

Testing Flour for Adulterations.—Mr. H. Kraetzer, of Lipzig, has indicated several modes of testing the quality of flour. He says that a good unadulterated flour, on a handful of it being taken, firmly pressed and placed on a board must preserve the pressed shape. If the mass gives way the flour is usually adulterated. Moreover, it should feel soft to the touch, although somewhat granulous. On passing a knife over it, it should spread widely, and if made into dough with a little water it should harden quickly. The best and strongest wheat flour must appear purely white, and if dissolved in eight parts of pure spring water it should appear milky white and no extraneous substances should show themselves on the surface. Ordinary flour must have a yellowish color and adhere to the fingers, and be dry and weighty. It should be capable of being pressed in the hand into lumps.—*Sanitarian.*

Parasitic Monads in the Blood of Fishes.—Mitrophanow has found two species, which he describes as new flagellate monads. They were obtained—one from Cobitis fossilis, the other from

Barassius vulgaris—by letting the animal's blood flow into a half-per-cent. salt solution. The parasite of the first named fish occurs in several varieties, and is named Hæmatomonas cobitis. It is worm-shaped, pointed at both ends, has a flagellum on the front end, and an undulatory membrane on the side. It is 30 to 40 μ long, and 1 to 1½ μ thick, and is very active in its movements. The second species is named H. carassii, and differs from the first by its greater length and more developed membrane.

In connection with this subject, the author criticises Gaule's views regarding the cytozoa observed in the frog's blood, and expresses his agreement with Lankester's description of them as parasites, given in the *Quart. Jour. Microsc. Sc.*, Jan., 1882.—C. S. M., in *Science.*

Vegetable Parasitisms in fishes appears, from recent observations made by Messrs. Olivier and Richet, to be so constant that it may be regarded as normal. These gentlemen examined about 150 fishes taken in the Channel and the Mediterranean, and in all of them they found in the peritoneal liquid, in the lymph, in the blood, and so in all the tissues, microbes more or less numerous, having all the characters of land microbes and being capable of similar reproduction. These organisms were mostly the bacterium called bacillus. The authors cultivated these microbes successfully. They also repeatedly made an experiment which consisted in putting a whole fish or part of it in paraffin melted at 120° or 140°. After solidification, the paraffine was coated with several layers of collodion and Canada balsam. The tissues thus guarded from atmospheric germs all showed, after a few weeks, an extreme development of microbes which were not those of putrefaction. The authors propose to investigate the mode of penetration of these parasites and their influence on the vital functions.—*Scientific American.*

An Internal Mite in Fowls.—Professor Thomas Taylor, microscopist of the Department of Agriculture, had occasion recently to dissect a sick chicken, and he found that all parts of the lungs, the bronchiæ, and the linings of the thorax and abdominal cavities were covered more or less thickly with a mite. An examination we were requested to make showed it to be in all respects identical with *Cytoleichus sarcoptoides*, Mégnin. This parasite is known in Europe to inhabit the air passages of gallinaceous birds, giving the trans-

parent and membranous linings of these passages the appearance of gold beater's skin speckled with flour. It is likewise found in the bronchial tubes and their divisions, and even in the bones with which the air sacs communicate. Mégnin believes that while the mite may be extremely numerous, so as to cause mucous irritation and induce asphyxia and congestion by obstruction of the bronchiæ, and that birds may thus die, yet it is incapable of causing, as Gerlach and Zundel believe, enteritis or inflammation of the peritoneum. —*Scientific American.*

Changes of Uterine Muscular Tissue After Parturition.—Prof. Wojtschechoffsky has examined, microscopically, ten uteri, removed from women who died within thirty-five days *post-partum.* He offers the following as the result of his investigations:

1. The fatty degeneration of the uterine muscular tissue, upon which the diminution in size of the uterus depends, begins immediately after parturition, and covers a period of more than five weeks.

2. The degeneration attacks alike all parts of the organ (fundus, corpus and collum).

3. It could not be ascertained whether the process began at an earlier period in the outer or inner muscular layer of the uterus.

4. The interstitial tissue of the uterus does not take an active part in the process of involution.

5. The process of obliteration of the blood-vessels covers a greater period than the entire involution.

6. The appearance of free pigment in the uterus is not stationary.—*Deutsche Med. Zeit.*

Development of the Red Blood Corpuscles.—Feuerstack has published a memoir on this subject. He gives first a brief mention of those authors who have sought to trace the development of the red corpuscles from the white; second, an abstract of Hayem and Pouchet's theory of the hæmato blasten; third, of other views of less importance. The author then presents his own observations and conclusions. "We find in the circulation of animals with nucleated blood-corpuscles every possible transition between colorless and colored blood-corpuscles. That they are transition stages from the white to the colored cells is shown by the course of de-

velopment during artificially induced blood-formation." The principal places of foundation in the pigeon are the osseous medulla, the spleen, the portal system, and the feather-shafts; in the frog, the bony medulla and spleen; in Triton, the spleen, and the lymph sinus near the bladder; in the eel, the spleen and the venal lymph sinus. (The author has overlooked the view, which is the one most plausible to us, that the colored corpuscles are merely nuclei, and not complete cells. His observations seem far from having settled the problem.)—C. S. M., in *Science*.

MICROSCOPIC EXAMINATION OF THE BRAIN AND CORD OF AN EPILEPTIC.—D. J. Kingsbury (*Jour. Nerv. and Ment. Dis.*, January, 1883) gives the following results in the histological examination of the brain of a chronic epileptic: In the frontal lobes and around the fissure of Rolando, increase in the cells of the neuroglia, with some obliteration of the perivascular spaces.

In the horns of Ammon there were, in addition to the above, cloudiness of the neuroglia cells, perivascular spaces scarcely noticeable, and ganglionic cells more granular than usual. Blood vessels dilated.

In the occipital lobe, dilated vessels, with spots of softening one-fiftieth of an inch in diameter around many of them, and increase of neuroglia cells.

In the ganglia the white matter was full of capillary infarcts not yet having undergone softening, showing distinct masses of blood corpuscles. Ganglion cells swollen, pigmented, highly granular. Some of the vessels had undergone amyloid degeneration.

In the medulla, increase of the cells of the neuroglia, dilated blood-vessels, swelling and granular condition of the ganglion cells.

In the spinal cord, increase of the cells of the neuroglia in the columns of Goll, and an occasional infarct or spot of softening.

The pathological changes in the brain were more marked in the right than in the left side.—*Md. Med. Jour.*

KOCH'S BACILLUS.—It has been the fortune of but few to have beheld this microscopical entity, which has been the most fruitful cause of death, and whose alleged discovery has created so much commotion in scientific circles. Distinguished microscopists have searched for it in vain and many have denied its existence, one boldly declaring that Koch mistook certain fat crystals for the bacil-

lus. Koch retaliates on his critics by charging them with incapacity, and in this he is warmly supported by those who have been fortunate enough to bring the microzyme within the field of their lenses. We have never gone out on a voyage of discovery for the parasite, and probably, in common with the many who have searched for it in vain, would fail to recognize it when we should see it. Dr. Stieren, in our present number, gives us a drawing of what he has discovered and claims to be the bacillus. He may be correct, but it would be no disparagement of his ability as a microscopist to doubt the correctness of his picture. It bears a stronger likeness to the fat crystals which Schmidt declares deceived even Koch, than it does to the bacillus as figured by W. Watson Cheyne, and a chromo-lithograph of which is before us. We have never seen an unquestionable Koch bacillus, and cannot say which of these pictures is the true one.—*Editorial in Therapeutic Gazette.*

A Magnificent Cabinet.—Dr. Lewis M. Eastman, of Baltimore, President of the Baltimore Microscopical Society, and known throughout the civilized world as a distinguished mounter of microscopic objects, possesses the largest cabinet in microscopy in the United States, if not in the world. Not only is his cabinet noted for its great extent, but also for the fineness of the collection. It is very full and complete in the departments of histology, pathology, microscopic botany and fungi, diatomaciæ algæ, minerology, etc. His coal preparations are wonderfully fine, showing their vegetable cells in cross and longitudinal section, almost as distinctly as in a freshly mounted vegetable section. His double and simple stained vegetable and animal sections are marvels of neatness, surpassing any that we have heretofore seen. An entire week could easily be spent in looking at his collection of diatoms, alone; and such diatoms! Diatoms from all parts of the earth, selected and arranged slides, which, for cleanliness and beauty of arrangement, would make a diatomaniac wild with joy. We spent an entire afternoon looking at arranged diatoms without exhausting that department.

Baltimore boasts of two institutions for the visitations of scientists—Johns Hopkins University, the best equipped institution for biological research in this country, and Dr. Eastman's cabinet of microscopic objects—the finest and largest in the world.—Dr. Up de Graff, in *The Bistoury.*

Visibility of Ruled Lines.—In an article in your issue of May 5, on "The Visibility of Ruled Lines," there are some statements which do not agree with my experience. I find that lines properly ruled on glass are similar to graven lines; they are smooth, clean cut, having a definite shape and depth. Such lines are always visible in the microscope, and central or oblique light will show the bottom of each cut as a dark or colored line, plainly visible, and requiring no graphite or other foreign substance to indicate it. The microscope is the test for a properly ruled line. The mechanical elements (pressure, etc.) entering into the process of ruling are not at all evidences that lines have been properly ruled. The slightest accident to the point of the cutter, or the surface of the glass not being perfectly clean, will spoil a line; that is, produce a scratch which cannot be satisfactorily illuminated in any light. Well ruled bands of lines, 70,000 or 80,000 to the inch, are visible in the microscope with central light; and with a Smith vertical illuminator (giving central light). I have seen 100,000 lines to the inch. As these individual lines have a width of about $\frac{1}{200000}$ of an inch only, it follows that the difficulty is not to see such a narrow line, but to eliminate the diffractions which tend to blur the image in the microscope, and so prevent the resolution or separation of the lines in a band of them.—C. Fasoldt, in *Scientific American.*

Development of Volvox.—Miss S. G. Foulke presented a communication upon the development of Volvox globator and its separated gonidia or reproductive spores. It was stated that in one case some of the gonidia freed themselves from the protoplasmic envelope, breaking the connecting filaments, and swam away. In some instances these free gonidia passed into an encysted state; in others, attached themselves by the remains of the filament to other substances, thus using it as a footstalk, and presented the appearance of Vorticella. Many of the free gonidia remained in a free swimming state. Others remained in the Volvox, developed in Amoebae, and emerged, after enveloping and digesting some of the neighboring gonidia. These Amoebae afterwards took the form of Amoeba radiosa, and then returned to their former state, seeming to have the power of using either shape at pleasure. As the parent Volvox belongs to the microscopic Algae, or water-plants, the change of its spores to a form in all respects apparently identical

with an animalcule furnishes another interesting illustration of the approximation of the lowest animal and vegetable organism.—*Acad. Nat. Sc. Philadelphia.*

To Stain Bacillus Tuberculosis.—Method devised by Ehrlich, modified by Gibbes :

No. 1—

(a) Magenta crystals, - - 2 grammes.
(b) Pure aniline (oil), - - 3 "
(c) Alcohol, sp. gr. 880, - 20 "
(d) Distilled water, - - 20 "

Mix (b) and (c) and add to pulverized (a) slowly while stirring and add (d) in same way. Bottle without filtering.

No. 2—

Nitric acid, - - - - - - - - - 1 part.
Distilled water, - - - - - - - 2 parts.

No. 3—

Saturated alcoholic solution of methyline blue, - - - - - 1 part.
Distilled water, - - - - - - - 4 parts.

Thoroughly dry a thin film of sputa on cover glass ; immerse (or float on) in No. 1 at 104° Fah. 20 minutes ; No. 2 long enough to remove stain from everything except the bacilli (1—10 min.); thoroughly wash in distilled water (30 min.); No. 3, one hour ; wash in water. When perfectly dry mount dry or in balsam. A good ¼ in. objective should show the organisms—the bacilli red, other material blue.

Histology of Insect Wing-Muscles.—The memoir of G. V. Ciaccio, to appear shortly in the Memorie dell' accademia di Bologna, may be thus summarized: In most insects the wing-muscles may be decomposed into fibrillæ (in others, into striated fibres: Sphinx, Libellula, etc.). In the former case the fibrillæ are united into bundles of various sizes by a cementing substance, in which the nuclei lie either both in the interior and upon the surface of the bundle (Hydrophilus, Dytiscus), or upon the surface only (flies). The bundles are held together by tracheæ, and sometimes also by fat-cells. In the cement are further always found distinct particles (Aubert's *masse grumeleuse interfibrillaire*), which do not occur in the other muscles. The fibres are composed of fibrillæ,

and have nuclei either upon the surface (Cicada) or in the middle (Libellula). In some insects the fibrillæ are arranged as in a folded lamella, the leaves of the folds running out from the center of the fibre towards the surface, seen in cross-sections. The nerve-fibres terminate in motor-plates (probably several for each fibre), consisting of a granular basal substance, in which are embedded the ramifications of the axis-cylinder. The wing-muscles are more readily dissociated into fibrillæ than those of the rest of the body, from which they are further differentiated by the absence of a true sarcolemma.—(*Arch. ital. biol.*, ii. 131.)—C. S. M., in *Science*.

Extreme Minuteness.—When vision is not aided by any magnifying process, there is a point of minuteness, as all know, when an object will make no impression upon the retina, and will not be seen by the unaided eye. But when the object is viewed by means of a microscope it becomes visible. There is a question, however, that remains unanswered, which is, whether any object may become so attenuated that it cannot be made visible by any means. Not many years ago, less probably than twenty-five, there were lines that could not be resolved by any microscopic lenses then in existence, which can be exhibited now without any difficulty; but, at that time, makers of lenses had not attained to the skill of making them with large angles of aperture, but now they are made with the highest angle that is possible, and, consequently, the capacity of such objectives can only be increased by greater skill in their manufacture. But the limit of angle of aperture having been reached—no opportunity remaining of increasing capacity in that direction—is it not reasonable to suppose, that, with present appliances, no greater skill in manufacture can be expected? Sir Royston Pigott, recently, at a meeting of the R. M. S., stated that he had seen globules of mercury, made by smashing a minute particle of mercury with a watch-spring, less than $\frac{1}{100}$ of $\frac{1}{10000}$ of an inch, or less than the millionth of an inch. Another member replied that he was not aware that there is any limit of visibility in the microscope other than that imposed by the sensibility of the observer's retina, the correction of the objective and the illumination.

The question is an interesting one and we may recur to it again.

Preserving Insects, Crustacea, Worms, and Small Vertebrates.—Professor K. Möbius finds that convenient prepara-

tions of the different stages of development of insects can be made by putting eggs, young and old larvæ, pupæ, and imagos in a glass tube filled with spirit, and having a stopper of cotton wool, then placing them, according to their age, in a stoppered upright vessel filled with spirit, in the middle of which is a cylindrical glass, which presses the glass tube against the side of the upright vessel.

To make tape-worms, long nemertines, long annelids, and similar organisms satisfactorily visible, he rolls them spirally on a thick glass tube and then places them in an upright cylindrical vessel of spirit on a little wider than the tube. The worm is fastened to the top and bottom of the latter by means of a fine white-silk thread, or, better still, with isinglass.

Very instructive sections of small mammalia, birds, frogs, fishes, and crustacea, can be made by attaching them to a board, dorsally, ventrally, or laterally, according to the section, and imbedding them in a freezing mixture, until they are quite frozen through. Then cut them with a broad-bladed knife, or saw if necessary, attach to the section-plane a glass plate, and lay the preparation is strong spirit until all viscera become so hardened that they retain their place. Then the preparation can be cleaned and mounted. The author's museum contains preparations mounted in this way of fishes in which the spinal marrow, brain, olfactory nerve, swimming bladder, etc., are very beautifully shown. In a longitudinal section of *Turdus merula*, the form of the air-sac is distinguishable within the breast-bone.—*Zool. Anzeig.*

THE "MICROSCOPE."—The first number of the third volume of this valuable journal is at hand. Two and a half years ago, Prof. Stowell entered upon its publication with considerable misgiving as to its success, being in doubt as to whether the subject of microscopy had become of sufficient interest in the west to warrant such an undertaking.

But its success has proved that his fears were unfounded; its circulation has steadily increased from the beginning, until it is now a paying institution. It has been enlarged from time to time, and now contains forty-eight pages exclusive of the advertisements.

Its matter is improved—now very good indeed—always was good—there is now a large number of contributors, and more

material from which to select. Every number contains more or less of illustration.

For some things THE MICROSCOPE is certainly to be commended. It is eminently practical, and yet deals with principles all the while, it contains practical suggestions and directions, valuable to every microscopist. Its pages are not running over with egotism and self-conceit. It does not claim to be the leading microscopic journal of the world or of this country.

During Prof. Stowell's illness, Mrs. S. edited and issued the January number, which was one of the best of the series. No one who knows Mrs. S., however, would be surprised at that.

There is a growing interest in the dental profession on the subject of microscopy, and I have no hesitancy in saying, that the members of the profession can nowhere else so well and so economically supply themselves with a periodical on this subject.

Those who wish this journal should address Prof. C. H. Stowell, Ann Arbor, Mich.—*Prof. J. Tait, in Dental Register.*

BACILLUS MOUNTING.—In the *Medical Press*, March 28, 1883, Dr. F. J. B. Quinlan thus describes what he considers the best method of preparing tubercular bacilli for the microscope. Take a button of phthisical expectoration in an advanced case—the first expectoration in the morning is the best; pour upon it a few drops of liquor potassæ, and work it with a glass rod until it becomes a homogeneous fluid. Put a drop of this fluid upon a microscopic cover-glass, from .006 to .004 thick, and allow it to dry. Now pass it lightly through the flame of a spirit-lamp, filter upon it a few drops of magenta aniline solution, and let it lie for twenty minutes. Place it in a mixture of one-third nitric acid and two-thirds of distilled water until it bleaches, which will take about five minutes, and wash it with water. Next drop upon it a little methyl blue solution, and let it stand for five minutes; and finally get rid of all aqueous fluid, by dipping it in absolute alcohol. To mount it, put a small drop of Canada balsam and benzine upon a glass microscopic slide, and put the cover-glass on it with the bacillar surface immersed in the balsam. This will soon harden, and will preserve the preparation indefinitely. The plan depends upon the fact that once the bacilli are stained red they cannot be decolorized by the nitric acid, which bleaches everything else; it is much facilitated and hastened by doing it at a warm temperature. By this method the bacilli are seen scarlet, and the other elements of the sputa blue. The bacillus is about one-third the size of a red blood corpuscle, and requires a power of at least 500 to exhibit it satisfactorily. The process is delicate and a little tedious; and from my own laboratory experience of it, I doubt if it will become a clinical test in general practice.—*Med. and Surg. Reporter.*

Reviews.

THE DISPENSATORY OF THE UNITED STATES OF AMERICA. By Dr. George B. Wood and Dr. Franklin Bache. Fifteenth edition. Rearranged, thoroughly revised and largely rewritten. With illustrations. Carefully revised and rewritten by Horatio C. Wood, M. D., Professor of Materia Medica and Therapeutics in the University of Pennsylvania; Joseph P. Remington, Ph. G., Professor of Theory and Practice of Pharmacy in the Philadelphia College of Pharmacy, Vice-Chairman of the Committee of Revision and Publication of the United States Pharmacopœia; Samuel P. Sadtler, F. C. S., Ph. D., Professor of Chemistry in the Philadelphia College of Pharmacy and University of Pennsylvania. J. B. Lippincott, Philadelphia. 1883. $8.00.

This work is now in its fifteenth edition, and for over half a century has been found wherever the English language is read. The revision has occupied most of the spare time of the editors for three years, and as a result we have a large amount of new matter. In the present index there are more than 16,000 titles, an increase over the last edition of nearly fifty per cent. In completeness it stands unrivaled in its line, and in accuracy it has no superior. The apothecary, the physician and the chemist can feel secure best when provided with a copy. The book is well known and needs no recommendation to insure a large sale.

BACTERIA AND THE GERM THEORY OF DISEASE. By H. Gradle, M. D., Professor of Physiology, Chicago Medical College. Large 8vo.; pp. 219. Price, $2.00. W. T. Keener, 96 Washington Street, Chicago. 1883.

This is an exceedingly interesting work of eight chapters. It comprises eight lectures given by Prof. Gradle before the students of the Chicago Medical College this past winter. The first lecture considers many diseases as a struggle between the animal system and the parasites invading it; the false doctrine of spontaneous generation, and the classification of bacteria. The classification adopted is that of Cohn. Lecture second gives the staining methods, the structure of bacteria, their composition, food, vitality, etc. Then follows a discussion of the various surgical infections due to bacteria, pyæmia, furuncles, erysipelas, etc.; also various diseases, as measles, small-pox, malaria, pneumonia, etc. We could quote page after page of this work that would be of interest to our readers, but we heartily commend the work and add that you can easily read all that is in it for the small price of $2.00.

HOT PLOWSHARES. A Novel. By ALBION W. TOURGEE, Author of "A Fool's Errand," etc. 610 pages, Illustrated, Cloth, $1.50. Fords, Howard & Hulbert, New York.

We have always read Judge Tourgee's narratives with great interest, and a perusal of this concluding one of the series increases our admiration for the author's power of description and dramatic presentation. The author sets forth the condition of the times during the twenty years preceding the war and brings forward at the same time noble and inspiring delineations of heroism.

The whole character of Hilda, her high resolves and mental experiences; the runaway team; the runaway slave; the fire; the coming of John Brown; make this a genuine novel. More than a novel even, it reproduces the inner life and motive power of the decade previous to our civil war.

Judge Tourgee finds his most attractive characters among the Southern people whose institutions, in this and his previous works, he scores in such unmerciful fashion.

BUT YET A WOMAN.—A Novel. By ARTHUR S. HARDY. 16 mo. $1.25. Ninth thousand in nine weeks. Houghton, Mifflin & Co., 11 East Seventeenth Street, New York.

It is very unusual in these days of many books to find any work in its ninth thousand even after many weeks. But in a very few weeks this book before us has reached a large sale, and the call for it to-day in the circulating libraries is said to be something remarkable. The general range of the book is lofty and its tone is deep and rich. One of the leading characters is a young physician of strong convictions. The life-likeness of its human figures, the tenderness of feeling, and the high moral sublimity, all combine to make this the story of the season for our light summer reading. "While there are no mathematics in it" says a reviewer, "there is poetry and art; and at its end might be written these words of moral: 'He that loseth his life for my sake shall find it?' "

THE CENTURY DICTIONARY.

"The Century" Company request students of English and those familiar with the vocabularies of the different sciences and trades to send them any special criticism, any rare or new word or new use of an old word, any peculiar phrase or local idiom, any rare citation or any especially appropriate citation illustrating a familiar

word, which may have attracted their attention, and which they may be willing to permit the editor of their dictionary to use. They especially request that, when practicable, the words be accompanied by some quotation and the name and page of the book in which it is found. Address, The Editor of the Century Dictionary, care of Century Co., Union Square, New York.

ON HEADACHES: Their Causes, Nature and Treatment. By William Henry Day, M. D. Fourth edition. Enlarged and illustrated. Paper; 8 vo.; pp. 148; 75 cents. In cloth, $1.25. P. Blakiston, Son & Co., 1012 Walnut street. 1883.

We have read this work with very much interest, and have derived the very best practical help from it. The nervous headaches, and the whole class of headaches incidental to childhood, are thoroughly discussed. Over 100 formulas are given adapted to various conditions. The practitioner will not finish reading the work before he will think of cases just adapted to the treatment given. This book should be carefully perused by every physician. Its pages will often be consulted.

AMERICAN MEDICINAL PLANTS. By Charles F. Millspaugh, M. D. Boericke & Tafel, 145 Grand street, New York. Complete in thirty parts. Part I now ready. Price $1.00 per number.

This work is to embrace all the American plants proven and incorporated in the Homœopathic Materia Medica. The plants represented will be drawn and colored in every case by the author himself from the specimens as they stand in the soil. Part I contains the drawings, description, habitat, physiological action, etc., of sanguinaria, inula, apocynum androsæmifolium, asclepias cornuti, pothos and iris versicolor. The coloring and drawing are superb. The homœopathic profession certainly ought to see that this work is a success.

ALCOHOL: As a Food, a Medicine, a Poison, and as a Luxury. By George C. Pitzer, M. D., St. Louis, Mo. Price, 25 cents.

This pamphlet is a reprint from the electroplates of the author's forthcoming work on Direct Medication. The subject is strongly discussed and some wholesome advice given. "No wonder the drinking man has a bad breath. If young ladies would meet fragrant breezes at the threshold of their future homes, they should beward of men who touch, taste or handle this unclean thing."

THE DAWN OF HISTORY. Edited by C. F. Keary, of the British Museum. Complete in two parts, 15 cents each. J. Fitzgerald, Publisher, 20 Lafayette Place, New York.

This is the first book in the English language in which an attempt has been made to present in popular form the sum of the information which scientific men have been able to gather with respect to the conditions of human life in the dim period before history. The work is intensely interesting, and treats of such subjects as: Earliest Traces of Man, Growth of Language, Early Social Life, The Village Community, Mythologies and Folk-Tales, etc.

THE CENTURY.

The July number of this magazine contains some very interesting reading. There is a fine engraving of John Brown, together with recollections of his famous raid. "Washington on the Eve of the War" gives us a fresh glimpse of the exciting times of '60 and '61. The early letters of Emerson, Anthony Trollope, The Native Element in American Fiction, with the "Topics of the Time" and "Open Letters" make this number fully equal to those of the past, and even a trifle better, for each number seems to excel its predecessor.

WILD FLOWERS AND WHERE THEY GROW. By Amanda B. Harris. Sixty illustrations by Miss L. B. Humphrey. D. Lothrop & Co., 32 Franklin street, Boston. Extra cloth; gilt edge; large 8 vo.; pp. 160; $3.00.

This is just the time of year to review such a book. It is not only most elegantly bound and beautifully illustrated, but it is also unusually well written. Who does not love the wild flowers, and who will ever forget where they grew in the olden times when we hunted for the trailing arbutus and trilliums? If any of our readers have some "little ones," then get "Wild Flowers" for them. The book will look elegant on the parlor table, and is just the thing to read under the apple trees.

MANUAL OF TAXIDERMY. By C. J. Maynard. Illustrated; 12 mo.; cloth; pp. 109. S. E. Cassino, Boston. 1883.

This constitutes No. 5 of the American Natural History series. It is a well known fact that to mount a bird neatly requires the utmost care, and patience and perseverance must be fully exercised. However, this manual goes over the whole subject of collecting,

skinning, mounting, etc., in such a clear and easy way that the youngest tyro can soon prepare skins in good shape and fine style. The author does especially well in putting his ideas so clearly and concisely.

THE HUMBOLDT LIBRARY OF POPULAR SCIENCE LITERATURE. Numbers 25 to 36, inclusive. Large 8vo.; pp. 653. J. Fitzgerald & Co., New York, Publishers. Price, $1.50.

Included in this large book are the following chapters: The Origin of Nations; The Evolutionist at Large; Facts and Fictions of Zoology; The Study of Words; Oriental Religions; Evolution and Biology. Such writers as Rawlison, Flower, Spencer, Proctor, Bain and Huxley contribute to this volume. It is good solid reading, of a high order. Just the book to read during your vacation or hours of leisure. It is a marvel of cheapness.

FROM DETROIT TO THE SEA. By W. H. Brearley, Detroit. Price, 30 cents.

We regret that this issue of our journal is too late for the three grand excursions of the seventh season. This pamphlet of forty-eight pages gives a vast amount of information of the White Mountains region, and answers a host of questions the traveler is sure to ask. It is fully illustrated with a large number of maps, engravings, etc.

THE CITY ITEM.

A bright newsy paper from New York. The number before us contains a fine picture of "the most successful advertising agent in New York," Mr. E. Duncan Sniffen.

THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY OF LONDON.

Do not forget this journal.

TUCKAHOE, or Indian Bread. By Prof. J. Howard Gore. From the Smithsonian Report for 1881. Washington. Government Printing Office. 1883.

SECOND BIENNIAL REPORT OF THE MICHIGAN REFORM SCHOOL FOR GIRLS. 1882.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

FOR SALE.—Mounts of renal tube casts and double-stained blood corpuscles. $1.00 per slide. A. Y. MOORE, 53 Prospect St., Cleveland, Ohio.

WILL exchange rubber cement for good slides. EUGENE PINCKNEY, Dixon, Ill.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

I WILL exchange good, histological for other first class mounts. S. G SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

FOR SALE.—Two Oxy-Hydr. Projecting Microscopes—cheap. I. G. LANGGUTH, 133-135 Wabash Avenue, Chicago.

FOR SALE.—A Spencer ¼ 115° or will exchange for a wide angle ½. F. O. Jacobs, Newark, O.

WILL EXCHANGE.—One copy of Leidy's Rhizopods of North America, for objectives or accessories. Address, C. H. STOWELL, Ann Arbor, Mich.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

FOR SALE.—One Tolles' 4-10 objective of 100° adjustable; also one 1½ inch objective of 23° by William Wales. Both made to order and first-class. A. L. WOODWARD, Syracuse, New York.

WANTED.

The next meeting of the American Society in Rochester;

And Professor S. A. Lattimore the president of it.

To find a more ingenious man than Mr. Griffith.

To know how many generations before Heitzmann's theories will be accepted.

A new way to induce subscribers to renew promptly;

Or some one to pay our printer's bill.

To see the Koch-bug that causes headache,

That we may pierce him with a lance.

To vote for Professor S. H. Gage for first vice-president.

Answers to the question "Of what use is the microscope to pharmacists?"

More names for our page of "Exchanges."

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND SCIENCE.

VOL. III.
WHOLE NO. 16 } Ann Arbor, October, 1883. No. 4

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Original Communications.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

BY D. S. KELLICOTT, PH. D.

THE sixth annual meeting of the American Society of Microscopists was held in Chicago, commencing Tuesday, August 7, 1883, and closing Friday, following. The local arrangements were complete for the comfort and convenience of the society, and all who were in attendance will long cherish the memory of our hearty reception by the scientific societies of Chicago. About one hundred members were present during the meeting and ninety were elected to membership. There was the usual earnestness and push displayed in the business of the society and in the reading and discussion of papers.

It is not expedient to present an outline of all the papers read, but a few may be mentioned without disrespect to those authors not mentioned. The papers of length, referring to the microscope and apparatus, were by Dr. Geo. E. Blackham and Prof. W. A. Rogers.

The former treated in a happy manner the Relation of Aperture to Amplification in the Selection of a Series of Microscopic Objectives. He discussed, from an optical and mathematical standpoint, the microscopical outfit which shall enable us to see clearly all the details which, invisible to the unaided eye, are yet visible by the aid of the microscope, the author keeping in mind this proposition: that it is worse than useless to employ, in any given case, any more of either aperture or amplification than is necessary for the work in hand. Concerning the combinations required by theory, he says: "I have selected, as a set of powers sufficient for all the work of any microscopist, the following:

One 4-inch objective of 0.10 N. A.= 12° air angle nearly.
" 1 " " " 0.26 " = 30° " " "
" 1-6 " " " 0.94 " =140° " " "
" 1-8 " " " 1.42 "

The first two to be dry-working objectives without cover correction, the third to be dry-working with cover correction, the fourth to be a homogeneous immersion objective with cover correction, and all to be of the highest possible finish, * * * and [the stand] to be furnished with six eye-pieces, viz.: 2-inch, 1-inch and ¾-inch Huyghenian and ½, ⅓, and ¼-inch solid."

The paper referred to by Prof. Rogers was A Critical Study of the Action of a Diamond in Ruling Lines on Glass. It was a masterly paper, which should be studied by all students of the microscope. The author believes "that the lines composing Nobert's finest bands are produced by a single crystal of the ruling diamond, *whose ruling qualities improve with use.* * * * If Nobert had any so-called secret, I believe this to have been its substance." Concerning smooth lines he said: "One would naturally suppose that a line of the best quality would be produced by the stoppage of the light under which it is viewed by the opaque groove which is cut by the ruling diamond. Without doubt, this is the way in which lines are generally formed. But it is not the only way in which they can be produced. An examination under the microscope will reveal the fact that, in some instances at least, a portion of the glass is actually removed from the groove cut by the diamond, and that the minute particles of glass thus removed are sometimes laid up in windrows beside the real line, as a plow turns up a furrow of soil."

The particles were shown to take four characteristic forms: Scattered chips, windrows of fine particles, filaments or filaments of circular form. The subject of resolution of fine lines is discussed. Who accepts the following proposed test? "With great respect for the honest belief of several microscopists, who claim to have resolved Fasoldt's band as high as 152,000 to the inch, I must yet hold to the opinion that in no case has the resolution been proved by a test which will be generally accepted by microscopists. There is one test and only one, which is absolutely decisive, viz.: the one proposed originally by Nobert, that of ruling a definite number of lines in a band of given fineness, and keeping the number secret until the microscopist could give the correct count, not merely in one instance but in several." The following concerning the power of the eye, is worth thinking about: "At present the unaided eye is a not very unequal competitor of the microscope in the matter of simple vision. In fact, there are certain phenomena connected with this question which can be better studied by the unaided eye than under the microscope. I believe it to be possible to see under the action of sunlight what cannot be seen under the objective. * * * I will not undertake to say how fine lines traced upon metal can be seen, but I suspect that the limit of naked-eye visibility is far beyond the capacity of ruling."

Among the new or improved apparatus described were the following: A New Microscope, with Concentric Movements, by Gov. J. D. Cox; A New Binocular Arrangement, by Edward Bausch; A Modified Spitzka Microtome, by Dr. V. S. Clevinger, and A Solar Microscope and Stereopticon, with ether-oxygen Light, by L. D. McIntosh.

Dr. F. M. Hamlin discussed in an able way the medico-legal subject, The Microscopical Examination of Seminal Stains. He had found the method given in the manuals unsatisfactory, and had used with success the following: "If the stain is upon thin cotton, linen, silk or woolen fabric, cut out a piece about one-eighth inch square, lay it upon a slide previously moistened with water, and let it soak for half an hour. Then unravel or fray out the threads at the corners, put on a cover-glass, press it down firmly, and submit to the microscope. If the fabric is of such a nature that it cannot be thus examined, fold it through the centre of the stain, and with a sharp knife shave off the projecting edge thus made, catching upon a

moistened slide the particles removed. After soaking a few minutes the powdery mass will sink, when the cover-glass may be put on and the preparation examined."

Dr. W. T. Belfield exhibited a series of micro-photographs, representing crystals of pure and adulterated lard, showing how adulterations may be detected. The crystals of pure lard are long, thin plates, with beveled ends, while those of tallow are plume-shaped. In adulterated lard the feathery crystals of tallow can be detected among the thin plates of lard.

It could scarcely happen that such a body of specialists should assemble and separate without a discussion on Bacteria, nor did they. Nearly the whole of a forenoon was given to the subject. Papers were read as follows: Preparing and Mounting Bacteria, by T. J. Burrill; Pathogenic Bacteria, by H. J. Detmers; and The Effects of Ozone on Micro-Organisms of Infusions, by Geo. E. Fell. The discussion of these papers was animated.

Among the biological papers may be mentioned one by Dr. UpdeGraff, on Certain Worms, and among other things, he described a new rotifer, *Brachionus Gleasonii.* "This brachion differs entirely from any hitherto described, more particularly in its possession of a dorsal horn or spine. The lorica is in the form of an oblong square, with the two transverse angles, posteriorly, acutely truncated, on the dorsal aspect. From the four acute angles thus formed project, with a slight inward curve, four spines of nearly equal length, and attenuated at the free extremities. In the median line, one-quarter of the distance from the brow, is situated a horn, curved slightly backward, and of a length corresponding to one-half the length of the lorica. * * * The length of the lorica, independent of the spine, 1-145 of an inch. It is found in stagnant ponds."

Mr. D. S. Kellicott read short papers in which he described as new *Cothurina variabilis*, *C. lata* and *Epistylis Niagaræ;* he also gave an account of a *Distoma* from the liver of the cray-fish and of another form found in the gills and muscles of the same host.

Dr. Thomas Taylor presented some interesting observations on some "Internal Parasites of the Common Fowl." Three species, two mites and a nematoid, came under the doctor's attention. One mite inhabits the bronchial tubes, the other was found in great numbers imbedded in the cellular tissue. These mites are known in similar situations in Europe, but it appears have not been announced

in this country. On examining the crop, which was greatly distended, of one fowl, numerous specks were observed distributed over the whole surface. These proved to be watery cysts of a new species of *spirillum* (?), the male differing from any other nematoid known to the author in having on the terminal point of its caudal appendage a bulbous body covered with short spines. The above-mentioned parasites undoubtedly cause disease and death among domestic fowls.

In histology a valuable paper was presented by Dr. M. L. Holbrook on "The Termination of the Nerves in the Kidney"; also one by Dr. G. E. Fell on "A Hitherto Unnoticed Peculiarity of the Human Spermatozoon." Dr. A. M. Bleile and Adolph Friel reported a continuation of their investigations as to the effects of division of the vagi on the muscles of the heart.

Dr. V. S. Clevinger reviewed the knowledge and recent progress concerning the physiology and patholology of the brain. "The study of brain and nerve tissue, as well as other biological investigations, is destined to reveal a great many phenomena, to result in saving of health and mentality to multitudes unborn. The thought of the ignorant is that scientists do not have ultimate knowledge; that they do not know the pathology of every form of insanity or disease in general. This should be no reason why we should not encourage these researches in every way possible, for year after year the grandest discoveries in these matters are being made by toilsome steps, and there is actually no predicting the benefits to accrue."

The important art of photo-micrography was treated by W. H. Walmsley in a paper giving the latest improvements and discoveries.

Dr. S. Huson gave a general review of our knowledge of the yeast plant. In the course of his remarks he said he had found it one of the most reliable tests for diabetic urine. The test is made by setting aside an uncorked bottle of the suspected urine for a few days. The presence of abundance of the fungus was a sure indication of the presence of sugar.

Papers of a general interest were received from Prof. Sarah F. Whiting on College Microscopical Societies; Prof. S. H. Gage on Cataloguing, Labeling and Storing Microscopical Preparations; and Prof. J. W. Mansfield on Division of Labor among Microscopists.

President McCalla's annual address was given in Weber Music Hall on the evening of Tuesday. He announced as his theme The Verification of Microscopical Observation. The subject was discussed in a comprehensive manner and in that rare style, the result of a gift, which held the attention of his hearers whether specialists or not.

At this meeting several important reports were received. The committee on eye-pieces reported through Dr. Blackham. The report favors naming oculars, like objectives, by their equivalent focal lengths in English inches. It also favors one or more standard sizes for the tubes of oculars; the standard medium size recommended is 1.25 inch, with the alternatives of 1 inch and 1.35 inch for those who wish smaller or larger tubes. The diameter .75 inch for the upper tube of the ocular, and 1.50 inch diameter for substage tube are recommended. The matter will receive further attention next year.

Prof. W. A. Rogers presented an exhaustive report upon a standard centimeter made by the United States Bureau of Weights and Measures, and presented to the National Committee on Micrometry, of which Prof. Barnard is chairman and Dr. R. H. Ward secretary. The National Committee tendered it to the American Society of Microscopists, by which it was accepted and placed in charge of the custodian of the society, Dr. Fell. A committee was appointed to frame rules for its control and use. The skill bestowed in its preparation, the great labor by Prof. Rogers in comparing it with standards, and the fact that the society has by resolution adopted it as a basis for future studies and discussions in micrometry, render this small piece of platinum-iridium cemented to a brass plate with silver solder of exceeding interest and value.

THE RECEPTION.

A pleasant feature of the annual gathering of the society is the soirée which occurs on some evening during the progress of the meeting. This year was no exception and the grand reception and conversazione at the Calumet Club House on Thursday evening, August 9th, participated in by the society and the State Microscopical Society of Illinois, stands clearly first in the history of the society. The particular exhibitions cannot be mentioned; it is safe to say they were of an excellent character and in most cases excel-

lently shown. Special tables were skillfully arranged for the convenience of the microscopists and the guests; they occupied two large and elegantly furnished parlors. There were two hundred and fifty microscopes in place. By the side of each instrument was a card bearing the name of the microscope, its owner and that of the object exhibited from 8 to 9 o'clock and of another from 9 to 10 o'clock. Much credit is due to the local committee on soirée, B. F. Nourse, chairman, for the very complete arrangements. The society by resolution expressed its appreciation of the courtesies of the Calumet Club.

The place fixed upon by the executive committee for next year's annual meeting is Rochester, N. Y.; the exact date will be announced as soon as determined upon.

The officers for the Rochester meeting are: President, Hon. Jacob D. Cox, Cincinnati; vice-presidents, Prof. Wm. A. Rogers, Cambridge, and Prof. T. J. Burrill, Champaign, Ill.; secretary, D. S. Kellicott, Buffalo; treasurer, Dr. Geo. E. Fell, Buffalo; members of the executive committee, Prof. A. H. Chester, Clinton, N. Y., Gen. Wm. Humphrey, Jackson, Mich., and Dr. H. A. Johnson, Chicago.

The display of the latest and best apparatus by manufacturers and dealers was fully up to the standard of former years. The following were represented:

W. H. Walmsley, Philadelphia Pa.; Jas. W. Queen & Co., Philadelphia, Pa.; Bausch & Lomb, Rochester, N. Y.; L. R. Sexton, Rochester, N. Y.; L. D. McIntosh, Chicago, Ill.; W. H. Bullock, Chicago, Ill.

[Continued from page 100.]

SENSITIVE DENTINE.

BY A. M. ROSS.

THESE facts are easily demonstrated under the microscope and by their aid we more readily understand why sensitiveness under the instrument lessens as advance is made into the sound dentine, and again we are taught that the fresher the specimen, the fewer reagents to which it is subjected, the more valuable it is.

It is well known that progressing dental caries ultimately causes exposure of the pulp, the period of time necessary to bring about this result, depending, of course, upon the character or rapidity

of the process. The character of the disease being governed by the condition; the tone; the quality of the resistive forces to disease in the general system, and secondarily by the local conditions such as the density of the dental tissues, their abnormal structural formation; crowded condition in the maxillary arch; their neglect in the matter of cleanliness, etc. Acute inflammation of the pulp usually results by exposure under rapid caries. But under the moderately and slowly progressing decay the conditions and results are markedly different. The condition is often one of chronic or low form of inflammation that results finally in death without having given a particle of pain. In the slower forms of decay the encroaching process is often met by secondary formations of dentine, the pulp meanwhile receding, or the pulp independent of its connection with the walls of dentine becomes ossified, eburnified or dentified, wholly or in part; if in part the calcification occurs in oblate, globular or oval masses. These abnormal changes may go on indefinitely without causing acute inflammation. Certain changes that occur in teeth undergoing slow decay can be observed clinically much better in the incisor teeth than in those of cuspid, bicuspid and multicuspid form.

It is very often that through ignorance or neglect the upper incisors have been undergoing decay for a long period. The attention of the dentist is called to them when they have begun to respond sharply to variations of temperature. Knowing the expansibility of sulpheretted hydrogen gases, the dentist applies the usual thermal tests and is suspicious of a decomposing pulp, but a careful cutting of the dentine *at its point of union with the enamel* dispels the idea of decomposition, for in many such cases it will be found *hyper sensitive.* The cavity above its margins is carefully cleared of its dark colored decay, the operation being quite painful to the patient. Reflected strong light through the tooth will reveal sometimes considerable opaqueness—often considered a reliable diagnostic sign of dead pulp. The introduction of a non-conducting filling material will soon prove the fact that the pulp is not decomposed a particle, for the trouble immediately ceases.

I have purposely prefaced what I wished to give concerning this subject microscopically, by the clinical facts, so that it would be more interesting to dentists who use the microscope in their studies.

Recently I had to remove molateral incisors for an individual

the condition they were in being well described by the foregoing remarks. The pulps were alive. The dentine of the roots and necks was supplied with a normal amount of living matter, but that in both crowns did not appear normal, *i. e.*, some of the canaliculi contained the normal continuous fiber of Tomes, while in others very near the fibrillæ were broken up or segmented to some extent.

I am very well aware that the bacterian might insist that I have mistaken bacilli or bacteria for segmented fibrillæ, but having never found this appearance in the sound dentine of teeth rapidly decayed nor in those wherein the process was moderately rapid, and having studied the varieties of bacteria found in the decayed and softened dentine, I can say that I know better, for bacteria and bacilli are not found in sound dentine.

I believe that what I have described as segmented fibrillæ to be a disorganization of the fiber of Tomes that is rarely met with. The fact of hypersensitiveness led me to make a prolonged and careful study of the fibrils that appeared continuous, believing that through them sensation was conveyed to the pulp, but I was unable to discover either an atrophy or hypertrophy of them, and they are reserved for further study. But the fact is well demonstrated that a low form of pulpitis has an observable effect upon the fiber of Tomes in isolated cases.

URINARY DEPOSITS.

BY C. H. STOWELL.

URATE OF SODA.—Urate of soda forms a very common urinary deposit, and it is found in the urine of persons in good health. It is held in solution in the healthy urine, but it is frequently precipitated. It appears, generally, in the form of amorphous, irregular, very small granules. It is slightly soluble in cold water and is readily soluble in warm water; soluble in the alkalies and in solutions of the alkaline carbonates and phosphates. If a solution of pure urate of soda be prepared and the salt allowed to crystallize, it will form small, acicular crystals. The deposit containing urate of soda varies very much in color from a pale, white cloudy precipitate to a pink, brown, or even dark red color. The urine containing this deposit is never turbid when freshly voided; it is only after the urine has cooled that the cloudiness occurs. Some

of the urine is placed in a test-tube and heat applied. If the sediment dissolves, but reappears again on cooling, then it consists of the amorphous urates. The urate of soda dissolves at about 100° Fahr., while the urate of ammonia does not dissolve much below 200°. After the urine has stood for some time the supernatant fluid is poured off and half its bulk of a solution of potash added. If this causes the mixture to become clear, not viscid, then the urates of soda and ammonia enter largely into the composition of the deposit. Filter some of the boiling urine, the filtrate will give a deposit of urates when it is cool. Add some strong acetic acid to the deposit; it will be dissolved, but will soon recrystallize, which shows under the microscope the rhombic crystals of uric acid. Urate of soda is found in spherical, globular masses from the surface of which project sharp points of uric acid crystals.

Urate of Ammonia.—Under the microscope urate of ammonia appears as an amorphous deposit. When prepared artificially and allowed to crystallize, it forms delicate needle-shaped crystals collected in spherical groups, or in opaque masses with fine projecting points.

To distinguish between the urates of sodium and potassium and the urate of ammonium is very easy under the microscope. The washed sediment is treated with hydrochloric acid and allowed to evaporate on a glass slide. If the deposit be either urate of sodium or potassium then the microscope will show, besides the crystals of uric acid, the cube crystals of the chloride of sodium and potassium. If the deposit be urate of ammonia then the leafy crystals of chloride of ammonium will be found. If the urate of ammonia deposit be treated with nitric acid and then filtered, and the deposit allowed to dry on the filter, and if to this dry deposit ammonia be added, a beautiful purple or violet-red color will be produced. This is known as the "murexide test."

Oxalate of Lime.—Urine containing oxalate of lime has usually an acid reaction and a high color. The deposit is scanty and generally conjoined with uric acid and the urates. After the urine has been allowed to stand for a short time a drop of the colorless, mucous-like deposit is placed on a slide and examined with a high power of the microscope. The drop of urine to be examined should be taken from a little above the bottom of the vessel, for the mucous deposit at the bottom appears to hold these crystals in its upper

Fig. 1. Crystals of triple phosphate. X 125.

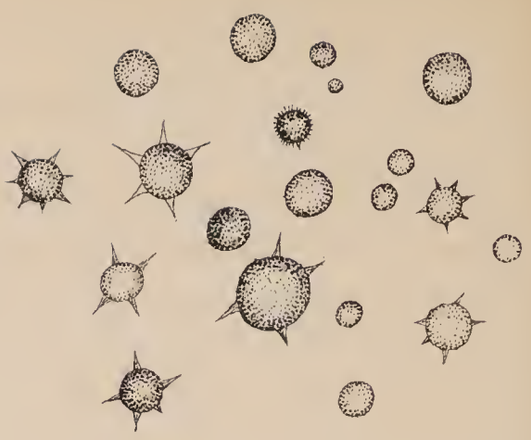


Fig. 2. Urate of Soda. X. 350.

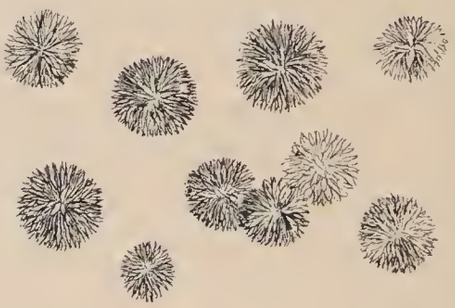
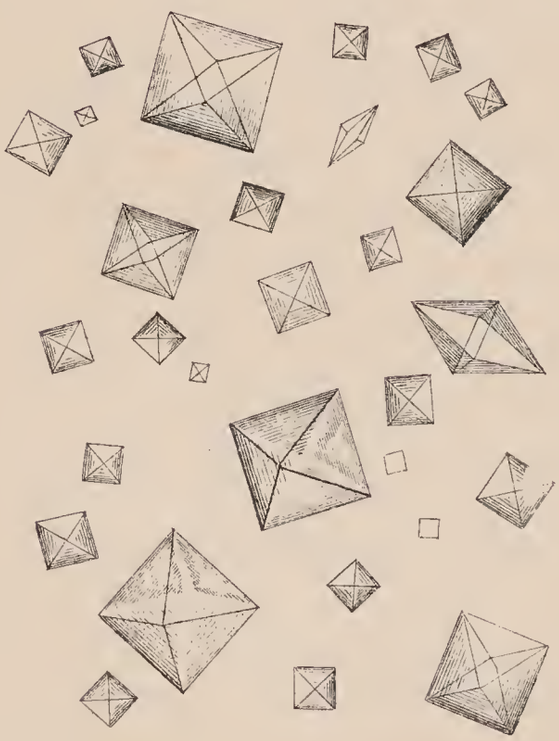


Fig. 3. Urate of Ammonia. X 250.



Mrs. L. R. Stowell, del.

Fig 4 Crystals of oxalate of lime. X 350.

Fig. 5. Dumb-bell crystals of oxalate of lime. X 250.

part; they are in the greatest abundance just in the upper part of the mucous deposit. The crystals of oxalate of lime are very characteristic and cannot be mistaken for anything else found in the urine. It is to be borne in mind that some of these crystals are very minute indeed, appearing only as angular points. This salt usually crystallizes in well defined octahedra, but sometimes it is found in the dumb-bell form. The dumb-bells of oxalate of lime are readily told from those of uric acid both by microscopic and chemical methods. The uric acid dumb-bell is dissolved at once in dilute potash solutions while the oxalate of lime dumb-bell is insoluble even in boiling potash solutions. Again, after the uric acid dumb-bell has been dissolved by the potash, if an excess of acetic acid be added the characteristic rhombic crystals will appear.

Oxalate of lime is insoluble in water, alcohol, alkalies, and the vegetable acids, hence it can be readily distinguished from the phosphates which are soluble in acetic acid.

This salt is soluble in the mineral acids and in the acid phosphate of soda. The octahedra of chloride of sodium can be distinguished easily from the oxalates by the fact that the former are readily soluble in water, and that the urine must be evaporated to show them.

PEAR-GRIT.

BY C. H. STOWELL.

REFERRING to an article in the last number of this journal on "Pear-grit as a Cause of Anal Irritation," Prof. S. Lockwood has forwarded a copy of a paper he read before the New Jersey State Microscopical Society in 1881, entitled "Fæcal Sclerogen." He diagnosed a case precisely as Dr. Rochrock did, and when the patient ceased indulging in the popular Bartlett, all the disagreeable symptoms at once subsided. The professor made a very nice test as follows: During the summer flowers were very scarce, and his bees were starving. Accordingly one day he supplied them with the core and rind of a ripe Bartlett. The little workers literally cleaned off to a nicety each individual granule, until specimens of sclerogen were in abundance. This identified the fæcal sand with the pear-grit. The professor asks: "Why is the Bartlett so cathartic? May it not be due to the mechanical action of this lignin grit?"

GLEANINGS FROM THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY FOR AUGUST.

C. H. STOWELL.

Organic particles in the air of mountains.—The air of mountains always contains germs although in different proportion to that of the plain.

The currents of air are constantly giving a circular shape to the particles suspended in it, and that such particles can then be raised to great heights. Insects play a certain part in this circulation. The essential composition of the air itself appears to be the same at all heights.

The withering of flowers and leafy shoots.—Cut flowers wither less rapidly when there are no leaves attached to the shoots, and if transpiration is prevented from the leaves the flowers remain quite fresh.

Leaves absorb more water as a rule through the under than through the upper surface; rain and dew, therefore, do not usually supply much water directly to the plant.

Depth of vision in photo-micrography.—The conclusion Mr. Davis reaches is that large objects cannot possibly be penetrated even with objectives of low angle and medium power, for what is seen through the microscope is the result of the combined effects of the accomodation of the eye and the focal depth of the objective, and when a picture is thrown upon a sensitive plate the first element is nearly eliminated and the only depth of vision attainable is that which the objective itself possesses.

Mounting in glycerine.—No cell is used. Just enough glycerine so that it will reach the edge of the cover-glass. Canada balsam in turpentine is then applied round the edge to close the cell. This is done with a glass rod drawn out to a point, but terminating in a little knob.

[Mrs. Stowell has used this method for a long time and is pleased with it. She did not think it a new method, as given above, or she could have reported upon it a number of years ago.]

The Brownian motion.—It is not dependent on the life of the particle. It does not depend on the material of which the particles are composed. The motion does not depend on the form of the particles. It does depend upon or is affected by: The size of the particles, the specific gravity of the particles and the nature of the liquid.

SOME EXPERT TESTIMONY.

BY C. H. STOWELL.

JUST the moment that any person accepts a position of public trust he exposes himself to honest criticism, and should he come forward as an expert in any particular line of work, then he must expect to be carefully reviewed. It is a fact that a jury of twelve men has no more idea what constitutes expert testimony than a mule has as to what constitutes real genius. When the question is one that concerns the value of a kicking horse or a spring lamb, then the average criminal juryman appears at his best, but when science is brought before him, that side of the case is most likely to succeed which can bring to bear the best oratory and the greatest number of witnesses. But this is neither here nor there. The question is: "Can human blood be told from that of the dog?"

In a recent case on trial at Wellsboro, Pa., Dr. Thad. S. Up de Graff, of Elmira, N. Y., swore very positively on this point. The newspapers give Dr. Up de Graff the credit of convicting the prisoner. It is not the proper place here to determine whether the prisoner was guilty or not; it is in the precincts of this journal, however, to determine whether the expert testimony was according to facts. Dr. Up de Graff was given some of the stained clothing to examine, and by processes entirely unknown to the writer (according to all accounts seen), by decantations, washings, etc., some corpuscles were procured and measured. Dr. Up de Graff positively testified that this was human blood and not dog's blood. When asked if he was the only one who could tell this, he replied that "there were but *four* men in the world who could tell human blood from dog's blood;" and, of course, he was one of them. When asked why he could do so much better than others, the reply was "on account of the superior character of his glasses, and that his microscope cost sixteen hundred dollars." The testimony of Dr. Up de Graff makes him give a positive size to the human red blood corpuscle. What do standard writers say on this subject?

Gulliver says they are the $\frac{1}{3200}$ of an inch.
Flint says they are the $\frac{1}{3500}$ of an inch.
Dalton says they are the $\frac{1}{3731}$ to $\frac{1}{3050}$ of an inch.
Richardson says they are the $\frac{1}{3378}$ of an inch.
Woodward says they are the $\frac{1}{3092}$ of an inch.

Frey says they are the $\frac{1}{2840}$ to $\frac{1}{4630}$ of an inch.

Welcker says they are the $\frac{1}{3230}$ of an inch.

Where is the exact size to judge by? The red corpuscles are also subject to change in size by the varying changes in the blood and by many drugs. Wagner, in his General Pathology, gives a long list of remedies that when administered change the size of this corpuscle. How delicate is it, also, to the various reagents used in microscopical work! I have seen red corpuscles as small as the $\frac{1}{3000}$ of an inch and as large as the $\frac{1}{2800}$ of an inch. I have never measured red blood corpuscles in lots of fifty each and had any two exactly alike, although using a delicate cobweb eye-piece micrometer and a one-fiftieth objective.

Listen to what Mr. Woodward, of Washington, says: "The average of all the measurements of human blood I have made is rather larger than the average of all the measurements of dog's blood. But it is also true that it is not rare to find specimens of dog's blood in which the corpuscles range so large that their average size is larger than that of many samples of human blood."

Human blood cannot be told from dog's blood, except under favorable conditions, and not invariably then. For the sake of microscopy it is a pleasure to know that only *four* men are ready to make such statements. There are a score of men in this country with glasses equal, at least, to Dr. Up de Graff's, who would testify directly opposite to him on this point. If Dr. Up de Graff is ready to receive a number of pieces of cloth, labeled and stained, respectively, with human and dog's blood, under favorable and unfavorable circumstances, this journal will see to it that said cloths are prepared with accuracy by competent parties. If he succeeds he shall receive all the glory these columns can sound forth, but if he fails he will be referred gently to his Wellsboro testimony.

[The only way for you to do, Dr. Up de Graff, is to pack up your machine and come and make us all a good visit at Ann Arbor. I will argue and argue, and eat oysters all night, if necessary—but be sure and bring Mrs. Up de Graff with you.]

FINAL EFFECTS OF BACTERIA.

BY J. M. ADAMS.

AFTER a couple of years cultivation and growth of bacteria, using about one hundred homœopathic vials, with various animal and vegetable infusions as commonly made, it appears that in all cases the material wrought upon is never left alone till it is fully decomposed as an organic substance and resolved back into its simple constituents.

Although many kinds of bacteria in many cases assisted each other in the work of disorganization, yet the main work was done by the *B. termo*, which greatly outnumbered, overpowered and destroyed all before it, including other dead, unencysted bacteria, or even its own dead.

Could an average proportion of bacteria, bacilli, micrococci and spirilla be made, it would stand about as 90:10:10:5; yet these varied very greatly in vegetable infusions, some forms appearing only transiently, and of the first named ninety-nine hundreths were *B. termo*. Some infusions were longer in being changed, as circumstances were more or less favorable; but in all cases, when the work of decomposition was fully finished, only an impalpable gray powder or sediment remained, with a beautifully clear and apparently pure liquid above.

How this beautifully clear liquid could be obtained from such a putrid mass is a mystery, and, strange to say, both sediment and liquid were free from smell, although some of the vials had been kept tightly corked, except to be examined occasionally.

This fragmentary experiment goes to show that these organisms properly hold their sphere between the living and the dead, to prepare new material out of the old for the immediate demands of new and subsequent organic life.

Enthusiasm is one of the most powerful engines of success. When you do a thing, do it with a vim. Do it with your might. Put your whole soul into it. Stamp it with your own personality. Be active, be energetic, be enthusiastic and faithful, and you will accomplish your object. Truly has Emerson said: "Nothing great was ever achieved without enthusiasm."

Editorial Department.

A NEW STATE MICROSCOPICAL SOCIETY.

IT is a fact that there are a large number of practical microscopists in the state of Michigan who are not only strangers to each other personally, but are also strangers to the various methods employed by each other in daily work.

We ask, therefore, why not form ourselves into a state society for mutual pleasure and profit?

We are acquainted with the busy society at Jackson and at Detroit; we know many hard workers at Grand Rapids and Kalamazoo. Now why not get together and become better acquainted with each other?

We never talk with a practical microscopist half an hour without getting some valuable hint for work. A Microscopical Society does not imply the preparing of long, tedious papers. Such a society as we have in mind will furnish only three or four papers, but it will furnish the material for a very successful soiree and an incalculable amount of pleasant and lasting friendship.

Will the members of local societies and microscopists throughout the state think of this matter at once and get the expression of their associates and correspond with us.

We should be able to have the first meeting early in the winter, and we will guarantee all a warm welcome at our beautiful city.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

THE reader will see from Professor Kellicott's report of the Chicago meeting that it was an unbounded success. While this was due to a multitude of circumstances, yet not a little of this success should be ascribed to the retired president, Professor McCalla. Of course without valuable aid from all the associate officers and from members as well, the meeting would have been a failure, yet the fact remains that during President McCalla's term of office, ninety-four new members were received, as against sixty-two last year, and increasing the former roll about fifty-three per cent. Thirty papers were presented and accepted for publication

and were read in full or by title. All these papers were valuable and some evinced great study and high ability. Professor McCalla's last official letter was numbered "278" and over six hundred copies of circulars were sent by him from his office. Without doubt the soiree was the grandest ever given in America, if not in the world. Two hundred and seventy-five elegant microscopes on the tables and two fine projection microscopes in rooms above. Truly the American society did not die on Professor McCalla's hands. He has the satisfaction of knowing that up to this time he has conducted the largest and most successful meeting ever held in this country, and that, too, away from the east where the majority of members reside.

ANY person finding this item marked with a pencil will understand that the books show his subscription unpaid for this volume. We give nearly three hundred pages of reading matter for one dollar. At this rate we cannot afford either to send individual bills or to carry delinquent subscribers. Please enclose a dollar to us by return mail.

SECRETARY KELLICOTT informs us that unless some unavoidable delay or accident occurs, the proceedings of the American Society will be ready to mail by the fifteenth of this month. We shall be both happy and surprised to receive a copy at that time.

WE will mail a copy of this journal free for one year to the president of each microscopical society in this country, upon the receipt of the proper address direct from the interested party. We will also mail a copy of the journal free for one year to any person who will agree to report to any scientific society of which he is a member, upon the contents of each number of the journal as it shall appear.

IT was noticed that in our last number Dr. Ross had an article "to be continued."

Dr. Ross mailed to us the complete manuscript for this paper, but somewhere and in some way a part of the manuscript was lost, and

we were obliged to cut it short and add the "to be continued." We wrote to the doctor explaining matters, when he very kindly sent us the interesting paper found in this number, to take the place of the copy lost.

WE have some beautiful mounting material of oxide of gold and wire silver, received from Prof. J. Alden Smith, of Denver, Colorado. Professor Smith sends a very liberal supply of each of these unique specimens, and they are well worth the price asked, fifty cents each.

DO not fail to read "The Genus Microscopista."

Professor Stowell and Mrs. L. R. Stowell are entering the literary field to quite an extent. Already Mr. S. has edited "The Students' Manual of Histology," a work of about 300 pages, now in its second edition, and together they have written a volume of 250 pages on "Microscopical Diagnosis." They also have in preparation another volume on "How to Prepare Tissues," besides editing "The Microscope," an illustrated bi-monthly journal of 48 pages, devoted to microscopical work connected with medicine and pharmacy.—*Ann Arbor Courier.*

Microscopical work is being developed in the University, and there is a discussion as to the formation of a special laboratory in which can be formed a school of microscopy. Work is now prosecuted in the following branches of science: Human Histology, Comparative Histology, Vegetable Histology, Botanical Research, Zoölogical Research, Palæontological Research, Pathological Anatomy, Psychological and Analytical Chemistry. Should a school be established Dental Histology, and a course in Microscopical technics would be added, thus making it broader and more complete than at any other university in the country.—*Ann Arbor Courier.*

Selections.

THE MICROSCOPE IN THE DIAGNOSIS OF DISEASES OF THE KIDNEYS.

BY I. F. MARKEL, M. D., MIFFLIN, O.

THE difficulty of making a diagnosis of some of the diseases implicating the kidney, is apparent when we consider how little is said of the details for the investigation of such diseases in the many text-books on general practice. Had the general practitioner the leisure, the proper means at his disposal, and, from previous training, a fitness for exact observation, we should find in a general practice one of the most valuable fields for renal pathology; as here, and here only, we have before us the earliest signs of departure from health, the various changes, the insidious or violent attack, and the only opportunity for tracing Bright's Disease from its beginning to its end. Nothing is said in those same text-books in regard to the preparation *necessary* for a microscopical examination of the secretion from the kidneys, although some are illustrated by drawings of the microscopic appearance of the sediment.

A cursory examination of our medical journals reveals the sad fact that very little space is ever devoted to the microscope and its value in medical research, and the occasional brief article that is found on this branch of medical science can seldom be credited to our home physicians. It is also to be deplored that our medical schools, or, at least, a vast majority of them, make no attempt to teach any method for investigation in microscopical technology.

Many young men are each year sent from our colleges as "practitioners of medicine" with no knowledge whatever of histology, pathology, and the normal and abnormal secretions of the human body, as revealed by the microscope. One should think that a great number of medical men would possess and be able to manipulate this wonderful instrument. But the revelations of it, and the progress in medical science credited to it, have failed to enthuse the busy practitioner who graduated from a school where the microscope was not one of the methods of teaching, or a means for investigation; and now few find time for learning and taking up this new occupation and method of advanced investigation.

The value of the microscope in the differential diagnosis of cer-

tain diseases is such that in some of those of the kidney it is impossible to make a positive diagnosis without its aid, and in all it will diffuse some light on their nature by a careful examination of the urine under a one-fourth inch objective. However, to obtain reliable data in diagnosis, no hasty or occasional examination is of much value, but only repeated, careful and continued observation will reveal the disease and indicate its course.

The general practitioner must have a definite knowledge of the histological structure and of the pathology of the kidney, in order that the instrument may be of any aid to his diagnosis.

Physiology teaches that the function of the kidneys is to take from the system nitrogen and water, and at the same time from the blood many of its salts. Hence, the excretion is the most accurate index of the condition of the organs. Here, then, we have ground for the maxim, "Whenever in doubt of a positive diagnosis, examine the urine carefully and thoroughly." Da Costa says: "But to glean the full benefit from an analysis of the urine, we must be acquainted with its complex composition, and be able to explore it qualitatively and quantitatively, and be accustomed to examine its deposits with the microscope."

The normal salts of the urine, the urates, uric acid, the phosphates, creatine and creatinine, are all most readily distinguished by the microscope, but the chlorides and sulphates are more easily found by chemical tests. The significance of these normal salts, when present in excess, cannot be spoken of in this paper.

Of the abnormal substances found occasionally in the urine, we find sugar, bile and leucine better detected by chemical means until microscopy is more advanced; but these substances, when found, do not indicate disease of the kidney, nor does tyrosine, which is readily detected by its long, shining, crystal needles, under a moderately high power.

The oxalates are most readily detected with the microscope, but their significance does not pertain to our topic, though their presence denotes some nervous or gastric derangement.

In considering blood as a foreign element found in the urine, a careful study is necessary to localize the origin of the hemorrhage, and this can only be accomplished with the microscope. When the hemorrhage denotes a lesion of the kidney, the instrument shows the renal epithelium, which is characterized by being globular, and

frequently accompanied by and entangled with the small casts of the uriniferous tubes, while the blood particles which come from the bladder are mixed with more or less vesical epithelium, which is flat and scaly, and readily distinguished from that of the kidneys. But this, to be of any value in differential diagnosis, must be supplemented by a careful observation of all the symptoms, local and constitutional, connected with the urinary derangement, as well as a careful examination of all foreign matter found with the blood and all its characteristics. The blood corpuscles which we detect with the microscope are not always of uniform appearance, and are never seen to collect in rouleaux.

Another substance most readily discovered by the aid of the microscope is fat, but in this it is well to confirm our discovery by the means which chemistry so readily affords. Here we must guard very carefully against errors, whether the fat denotes such a degeneration, or is chylous, or in free globules, or associated with albuminuria and tube casts, and attended by dropsy, or whether it comes from the ingestion of such articles as contain fat in large quantities. Fat may continue in the urine in free cells without albumin for years, and not denote disease of the kidney.

Another substance of much interest to the microscopist and diagnostician, is pus as found in the sediment of the urine. Dr. Fell, in a paper read before the Medical and Surgical Society of Buffalo, last September, said: "With the microscope the pus corpuscle is readily recognized, and this use of the instrument is alone so far-reaching in its value as to warrant the statement that it alone furnishes sufficient reason for the teaching of microscopical technology in every medical college throughout the land." Though the pus corpuscle may sometimes be indistinct, and become a source of error when the urine, on being voided, is strongly ammoniacal, by being confounded with that of the mucous corpuscle, heat and nitric acid make a ready test; for where pus is found albumin is also present, but with the mucus corpuscle albumin is never associated, although entangling quantities of epithelium cells, thus adding microscopical evidence. The localization of the source of the pus is, by close study, much enlightened, for the corpuscles from the kidney are irregular in contour and nuclei, and with partially destroyed cells. The corpuscles of the bladder are regular.

"The presence of albumin in the urine is considered by the ma-

jority of physicians as the index of a pathological condition, although Bernard, Hoffman and others have pointed out that albuminuria may be met with in persons whose health is perfect, and under certain conditions of alimentation." M. Marcacci has proved that albumin may be found in a physiological urine, by a series of observations on himself. Albumin, therefore, denotes nothing except when found in connection with the different tube casts. But albumin means casts in the vast majority of cases. It is the small quantities of albumin that may lead to an error, which may not only confuse the physician, but complicate the patient's chances for recovery. The small quantities of albumin may come from the blood or pus, or possibly from the prostate or urethra. Albumin is also found in the urine when lithic acid is eliminated.

Now, noting some of the diseases of the kidneys wherein the microscope reveals the signs whereon the diagnosis is based, we shall begin with those in which tube casts are found in the sediment. The urine should be fresh for a microscopical examination, and from the nature and the character of the casts the differential diagnosis is made. In an article in the London *Lancet* we find this proposition: "Neither dropsy nor albumin is usually present in chronic Bright's disease, and when present they denote acute or epithelial change." The most generally accepted account of the disease and its symptoms fail to recognize it in by far the larger number of cases in which it already exists. One of the most fatal forms of Bright's disease is where there is intestinal inflammatory destruction, with little or no albumin, but with tube casts, which are hyaline and pale granular, and which tell to the physician of an ending which, if the patient but knew it, would make his heart sink within him.

In the acute form of the disease, or acute nephritis, we have narrow hyaline casts, epithelial casts and cells, and blood casts, which all signify the acute catarrhal stage of nephritis, such as follows scarlet fever or exposure to cold and wet. These are accompanied by much albumen, the urates and uric acid, and sometimes even oxalates. Fatty and waxy casts belong to the chronically enlarged kidney, and a preponderance of any kind affords an indication of the exact state of the kidneys. Broad hyaline casts, and dark, granular, epithelial casts—the urine at first highly albuminous, but further along in the disease slightly so—are usually found

in that form of renal chronic disease which ultimately results in the wasting and shrinkage of the kidney.

In renal hematuria much can be done, and readily, by investigating the sediment, thus learning whether it is due to cystic degeneration, cancer, ulceration, tuberculosis, or irritation from a calculus, and each must be studied with the symptoms and physical signs, but each has in the field of the microscope its peculiar characteristics. In intermittent hematuria we find crystals of the oxalate of lime. In cysts, if containing a parasite, the vesicles will show its characteristic structures, but in ordinary cysts the microscope is of no value as yet. In nephralgia, in its various conditions, the microscope is of value in diagnosis, but here we may find the feature which is the index to be wanting at times. In suppurative nephritis there is blood and pus, and all the casts found are seen to be covered with pus corpuscles. In pyelitis we may have the crystallization of the nitrate of urea into irregular blades set at angles, and some feather-like crystals. In abscess of the kidney, and in perinephritis, the microscope is yet of doubtful value in making a positive diagnosis, and will be until the science has made more progress. In simple albuminuria there is no exudation, hence no tube casts can be detected in the urine, except occasionally after a long search.

In conclusion we would only say that in so wide a field much is yet to be added, by diligent investigation, to what is already known; and in the near future, much that is now speculation in renal pathology will be clear and definite, and he who will make a diagnosis will apply his eye to the microscope.

"The Genus Microscopista."*—The annual address for 1882 to the Microscopical Society of Victoria was delivered in November last by the Vice-president, the Rev. J. J. Halley.

After referring to the small number of members and the still smaller number who contributed papers, the address continued as follows: "In such circumstances, perhaps, this annual address may properly take the form of what would in theology be called apologetic. We must defend our position, and show the *raison d'être* of our existence. Looking, then, at our society as we are accustomed to look

*Southern Science Record, ii (1882), pp. 285–9.

at the various divisions of sentient life as they come under our investigation, we will proceed to examine the various species of what we may call the genus *Microscopista*, the generic characteristics of which are, that they examine minute objects with artificial aid more or less elaborate, and that they do this with a more or less useful end in view.

"Of this great genus, whose habitat is the civilized world, the first species is the *M. delectata* (*sic*), or the playing microscopist. This is the lowest species in the scale of development, and some observers consider that the other species are all derived from this one, while a few who have no love for the genus affirm that this is the one and only species, the others so-called being only transient varieties. But *M. delectata*, though often despised, is by no means to be set aside. We will grant that in his hands the instrument is a plaything and nothing more; that he looks at the wondrous beauties revealed merely to please the eye; that he peers into quaint and curious forms merely to satisfy curiosity; that the valve of a diatom is interesting to him merely as it is strange; and that the organs of an insect or the home of a Bryozoon only allure as they are novel. In this there is nothing to be despised. The great order of the Bimana must be amused, and the more rational the amusement the better; and surely it is not less rational to find amusement in examining the wonders of nature, her paintings of marvellous beauty, her sculpturing of unrivalled forms, that in turning over the prints of man, or spending time examining and collecting his effigies; surely as reasonable as counting the pips on a card, as cannoning ivory balls, or bouncing India rubber ones over a net. We will not, then, push out of existence the playing microscopist; for my own part I have for him a very tender regard, being perhaps myself but little removed, if at all, from this species. In your name I will welcome all such to our gatherings, assuring them that they will find here much to amuse them if they do not care to learn; but we will hope that in consorting with higher forms they will imperceptibly, perhaps, yet surely, by the force of association, put on new features, lose obsolete and useless organs, and develop into higher and higher forms, and this not in descendants yet to be, but in a conscious life-history. Again I say we are delighted to find, and would gladly have more in our midst of *M. delectata.*

"We advance next to *M. evocationes* (*sic*), or the collecting mi-

croscopist. This is only one of the somewhat despised forms: 'Only a collector,' with an elevated head and a righteous shrug, is a phrase often heard. But in great economical systems 'mere collectors' play a most important part. This solid world, with its fertile plains, is just a vast collection gathered together by collectors, organic and inorganic. And collectors provide the material for others to work on and work up. The higher workers not infrequently have neither the time nor the opportunity to collect, and, so far as the preparation of microscopic mounts is concerned, have often not the manual skill and delicacy of touch to be successful. Such must depend for their mental pabulum in its raw state on others. And there is work of immense importance to be done by the 'mere collector.' If such cannot add to our knowledge by their own investigations, if from their brains can come no world-shaking theories that shall make their name and our society's name familiar as household words, they can add to the treasures of our cabinet, their quick-seeing eye can pick out new forms, their diligent feet can take them to unexplored parts, and their delicate hands can mount their finds in such a way that the true investigator will be able to read with his glass, as in a glass, natural riddles, adding to the world's store of knowledge. Our society cannot afford to despise the collector. Far from it; we will thankfully receive from any quarter, and ardently welcome, genuine specimens of *M. evocationes*.

"*M. tabernarius*, or the tradesman microscopist. A large and growing species, every day producing novel varieties, and one that in these days must be treated with no little respect. Utilitarianism has invaded the old halls of science, and in these modern days not one but many a philosophers's stone has been found in the crucible of the chemist and the jar of the electrician; and mean homes have turned palaces, and common delf silver-plated, at least, through fortunate discovery. Yes, gold in abundance has followed in the track of the scientists. All this is but *vero verius*, nothing more true. In saying the scientific plaything of yesterday is the mighty machine of to-day—the toy of an enthusiast one day, the necessity of life to thousands the next—it would be but a work of supererogation to remind you of the giant strides made in the development of electric science and practice. In our own line we can perhaps look for no startling discoveries that shall revolutionize the world of daily life, but there is yet room for the *Microscopista tabernarius*. I

do not mean the man who makes the instruments, for him there undoubtedly is ample room, and almost every month we have to hail improvements that make our work more easy. But the Microscope is a tool of trade for some. We have heard that the intricate and charming markings of diatoms and Foraminifera have been used by pattern designers, and in some trades the Microscope is daily used. About a year ago I was at the Italian National Exhibition at Milan. Among the most interesting of the exhibits was the process of silk producing and manufacture. At that exhibition the results were not merely shown, but all the details from the beginning to the end, and a row of microscopists with persistent care examined the silk-worm eggs, picking out and rejecting every egg that showed any symptom of disease. But why go to Milan? Has not the greatest of your legislators declared that by the aid of a powerful microscope he was enabled to determine on the spot the magnificent character and splendid suitability of the Stawell stone for our new halls of legislature? In this Society it would be of thrilling interest to hear what was the powerful instrument he used—how he used it in the trying circumstances of the Parliamentary picnic—what he learned—and how he learned it by looking at a lump of sandstone? But this is perhaps too much to expect; let us be content that the value of your instrument has been acknowledged in those halls of wit and wisdom. I think I must place this new-caught specimen in a unique sub-species of his own, and label him *M. ludificatio*. I hardly dare translate this title, but its English synonym is not far off 'humbug.'

"Under *M. tabernarius*, as a sub-species, we will place *M. detergitata* (*sic*), or the detective microscopist. Here we come to a class directly useful to mankind. By the aid of the microscope we discover largely what it is that we eat and drink, how sometimes very widely the real differs from the apparent, and how true it is that "things are not what they seem"—a wide field, that has hitherto not been taken up to any extent by our Society. Under this species I had intended to have ranged myself during the past year, and to have done something worthy of your attention for this meeting: but, alas, it has been but a good resolution, and gone, I fear, where many other good resolutions have gone before it. This I have done: prepared a series of test starches for comparison, some eighteen or twenty slides of which I had the pleasure of placing in the Society's

cabinet. I have also made a preliminary examination of some of our ordinary articles of food, not sufficiently exact to go into detail, but enough to give to you a hint as to what may be done, and to indicate a useful line of work. For example, I have found arrow-root adulterated with sage, and arrow-root, tapioca, and sago all showing more or less of the well-known form of potato-starch. Cocoa has exhibited potato-starch, sago-starch, in one case and the beautiful grain of *tous-les-mois*, besides sugar crystals and inorganic matter, that may be coloring matter, or may be dirt—in one case, I suspect, plaster-of-paris. Mustard showed pea-flour, potato-starch, and wheat-flour, as well as inorganic matter, probably plaster-of-paris. Oatmeal showed wheat-flour, and maizena potato-starch.

"I give these just as examples of what is and what may be done. It is not our province to do with legislative action, yet we have, I think, a right to know what it is that we eat and drink. Many of the adulterations are in themselves harmless to the public health, though not to the public morals. This species of microscopist is much needed, and I regret that, so far as our Society goes, we have no member that has given himself up to this work in a systematic and careful manner; but certain it is that such a work needs doing, and doing well. I can only bid you hope that our energetic Secretary will secure for us numerous specimens of *M. detergitata.*

M. medicus is the medical microscopist. Our learned and much honored President comes, of course, under this title. One would say that specimens of this species would be found in abundance about our rooms, making themselves heard above the more subdued voices of other species; for surely the microscope must be a necessity for medical men, and one would certainly have predicted that our Society's literature would have been enriched by their contributions many and learned; but, with the one exception of our President, I do not think that for years a solitary specimen of the *M. medicus* has been heard in our gatherings. I cannot altogether account for this: I do not know if the class is an exceptionally shy one—shrinking from publicity—in no case courting profane gaze, and with a modest dislike to uttering opinions in gas-light, and never on any occasion advancing thoughts that are not well matured and tested. It may be the *M. medicus* has a difficulty in consorting with other species of the same genus, and prefers buzzing only where his more

immediate kin are found. I do not know what bait must be prepared to catch this remarkable shy form: possibly our President may give our Secretary a few hints on the subject.

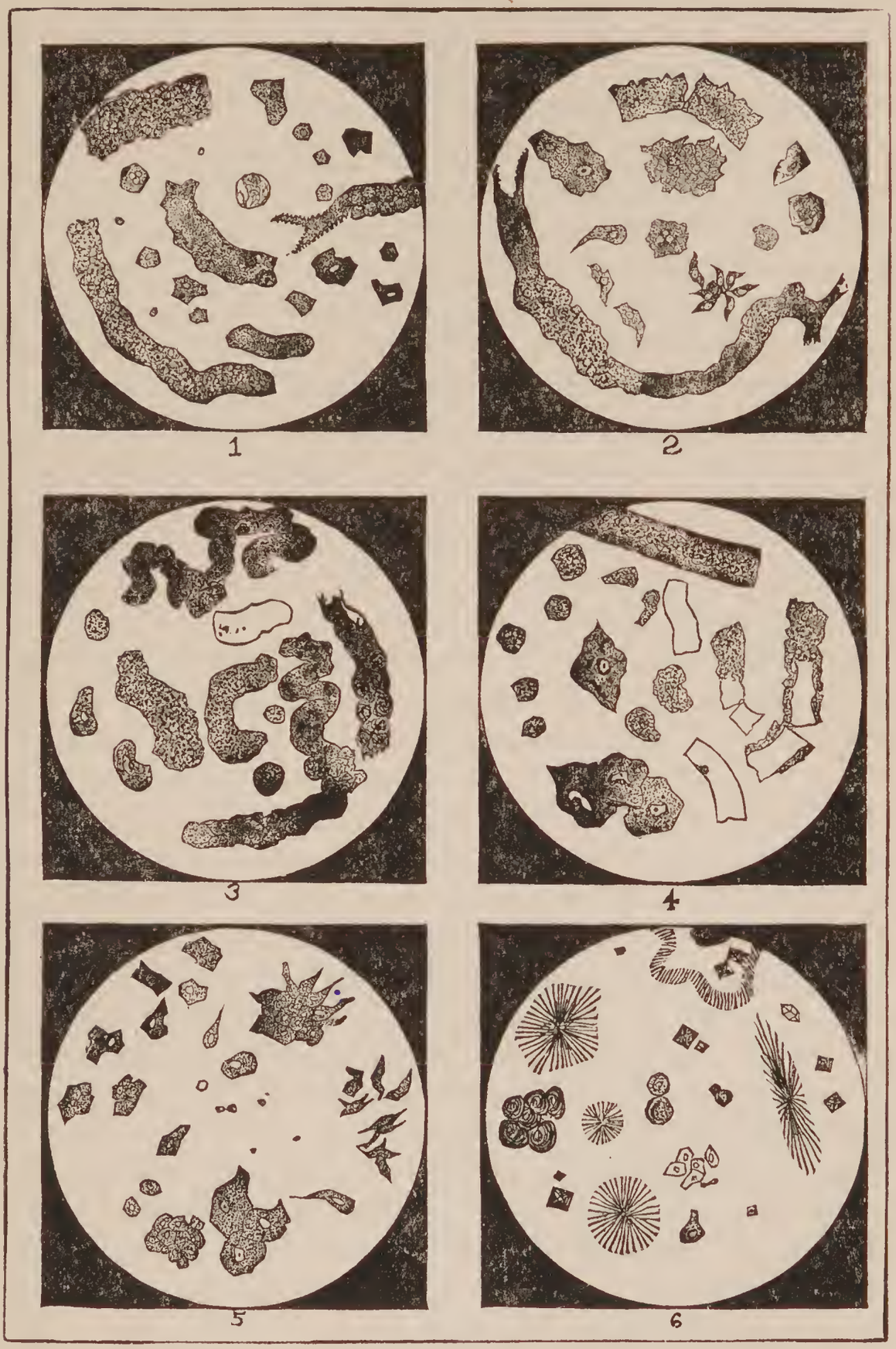
"My last species is the *M. germanus*, a true genuine microscopist. Of this species we have some admirable examples, men who patiently and perseveringly take up some section of the wide world of science, and work on and on till they have worked out some beautiful system, or worked up the whole life-history of a race. It is those men who add to the sum of the world's knowledge, and so add to the sum of its happiness. The discovery of truth in any one line cannot but be beneficial, for every discovery of truth helps in the discovery of other truth, and sometimes in lines remote enough from the first. The story of the world of science is full of instances of this. And every man who lays a stone may know that he is doing something for the completion of that grand temple of truth that shall fill the world with its radiance.

"Gentlemen, we exist that we may bring together these various classes, all interested, though in different ways, with microscopy. Men of kindred pursuits naturally desire to meet each other, or should do so, that there may be mutual help and the interchange of ideas, and that by such help knowledge may 'grow from more to more.'

"I think I have shown that we have a right to exist, that by our existence we may not only amuse and profit each other, but do good in the community in which we are placed, and perchance do something to help in the advance of knowledge in the mighty world of science.

"May I trust that next year will be far more prosperous than any preceding ones have been?"

The Microphyte of Yellow Fever.—Dr. Carmona del Valle says, in a recent number of the *British Medical Journal*, that he has detected the microphyte characteristic of yellow fever, and proposes to name it *peronospora lutea*. The germs of the cryptogam are found in the patient's excretions, and in fluids of the organism, especially the blood and the serous discharge resulting from blisters. The doctor has also discovered in the matter vomited, besides spores, a large quantity of mycelia of various colors, black predom-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inating. The *vomito negro* (black vomit), according to this author, is due to the presence of these black mycelia; and the blood has not any influence on the color. In urine, he has observed small yellowish granules, which give birth to spores. If rabbits or dogs be injected with this urine, they exhibit febrile symptoms, with increase of temperature, which last two or three days; and the urine of the animals under experiment presents the same kind of granules as those observed in that of yellow fever patients. Animals which have once been subjected to injection resist the effects of a second. In order to render an animal exempt from yellow fever, it is sufficient to inject into it a small quantity of distilled water containing the specific fungus of the disease. The spores of the *peronospora lutea* are present in the urine of yellow fever patients for a length of time after their recovery. Their presence, he says, is the reason why such patients are not subject to a second attack. To test the amount of danger of prophylactic injection, he performed it on himself without any bad results; his urine, however, for some time contained the characteristic granules.

This leads us to republish, in a condensed form, with new plates, Prof. Holland's (of the University of Louisville) article that appeared in our columns four years ago.

Fig. 1 represents the deposits from the urine of a white boy, aged fourteen years, who had for several weeks complained of malaise and frequent urination. It was drawn by catheter on the fourth day, after deep pressure above the pubes. He was delirious, and died on the fifth day. The urine contained diffused granular matter and renal tube-casts, highly, moderately, and slightly granular. Some have epithelium embedded, and in various parts of the field are single fat-cells from the urinary passages, which are studded with small fat globules. The urine was acid, lemon yellow, and contained bile pigment and one-half albumen.

Fig. 2 represents the appearance of a copious brownish deposit obtained from the urine of a white man, aged thirty-five, who had been sick of yellow fever four days. He had hemorrhages from various parts, and died on the seventh day. The case was regarded as typical, and the water was passed freely.

The objects seen are: At the top, a highly granular tube-cast, made probably by degenerated renal epithelium. Such cylinders were quite abundant. At the bottom is a cast of a convoluted tube,

large enough, in one part, to show that it was probably made of the disorganized cellular lining. It diminishes in size to the calibre of the tube when intact. The clear portion is probably the mucoid matter of Beale. In the middle of the field is a patch of tessellated epithelium from the bladder, some scattered cells with strongly-marked nuclei and spindle-shaped cells, probably from the bladder. At the right are "compound granule corpuscles."

This appearance of the deposits is quite usual on and after the fourth day.

Fig. 3 represents the deposits found in the urine of a robust-framed white male, aged forty-five, who slowly regained his usual health. This urine was voided without difficulty on the eleventh day after the primary chill. It was acid, deep-red yellow, 1.024 specific gravity, normal in quantity, and about one-fourth albuminous. It contained bile pigment and a heavy lateritious deposit. The amorphous urates, being so abundant, obscured other objects. Gentle heat was applied, and the microscope presented a field as seen in this figure, viz.: tube-casts, granular, epithelial and hyaline, renal and vesical epithelium, stained yellow. The worm-like mucoid casts were of a yellow tinge.

Fig. 4 represents the objects seen in the deposit from the urine of a woman aged thirty, and at the fifth month of gestation. It was voided on the fourth day, and the woman died on the seventh day of the fever. The urine was acid, scanty, bright yellow and one-third albuminous. It contained epithelium from the vagina, urinary passages, and kidneys, small waxy casts, with a sharp fracture, some imbedded in granular matter, and one containing granular matter in its axis. All the objects were stained yellow.

Fig. 5 represents the microscopical appearance in several cases examined on the third day before the occurrence of albuminuria. The objects are, squamous, round, and transitional epithelium from the bladder, and spindle-shaped cells probably from the pelvis of the kidney. Sometimes they were in patches which covered half the field. They were found sparingly in some mild cases in which albuminuria did not occur.

Fig. 6 shows the deposit from the urine of a man, æt. 45, who was convalescent on the twelfth day of the fever. This urine, which was passed on the fourth day, was alkaline, yellow from bile pigment, not albuminous, and gave a light deposit. In this figure

may be seen bladder epithelium, single and in patches; groups of leucine spheres of a yellow color, with well-defined, outlines and concentric markings, as shown at the left and center; tyrocine needles in stars and sheaves, and abundant octahedra of calcium oxalate.—*Leonard's Illustrated Medical Journal, Detroit.*

The Practical Value of the Bacillus Tuberculosis.—While the wordy warfare wages concerning the causative properties of this bacillus, it is well for us to gather together whatsoever we may of practical value in our every-day work, concerning it.

Dr. G. A. Heron, who recently delivered a lecture on the subject, (*British Medical Journal*, April 28, 1883,) has found the bacilli in the sputa of 116 patients, all of whom presented, sooner or later, what he considered unmistakable evidences of consumption. He has not yet seen a case, with absolutely no signs of lung mischief, in which he has detected the bacillus of tubercle in the sputum. He has found them in the sputum of a patient in whom there were no signs of lung disease, but where, after a time, consumption manifested itself, which condition was verified *post mortem.* From his own experience and the authorities he quotes, it would seem reasonably fair to assume that when the bacilli tuberculosis are found in the sputum, it is a pretty strong indication that the patient is either threatened with, or actually has consumption, and when, in connection with their presence, physical signs exist, the diagnosis can be made with considerable accuracy.

When very plentiful, the prognosis is unfavorable, and *vice versa.*

Wherefore it would seem that whenever we have any cause to suspect tubercular troubles, as in long-delayed convalescence after pneumonia or in otherwise unaccountable prostration, and the like, it behooves us to make a microscopical examination of the sputum for bacilli; if we find them, we can enjoin the usual precautions and advice for consumption, which, to say the least, will be harmless, even though the disease does not exist.

Whether these bacilli are really the cause, *per se*, of consumption, we do not yet know; but if they afford us, as it would seem that they do, a means of detecting the disease in its incipiency, an acquaintance with them is a very valuable acquisition to our knowl-

edge. The following is the process described by the author for detecting the bacilli:

"There is, so far as I know, no other method but Ehrlich's now in use for staining the bacillus of tubercle. Various modifications of his process have been suggested; but in all points of importance it remains as it was given to us by Ehrlich himself. The modifications, which are improvements of this process, aim at giving the staining mixture a uniform composition; and several different formulæ have been suggested for that purpose. The one now in use in this hospital, and I have myself used it for some months past, is Weigert's. Its composition is saturated alcoholic solution of fuchsin, or methyline violet or gentian violet, 11 parts; anilin water 100 parts.

"In warm weather good results are to be obtained when the staining process is carried out at summer temperature, and without the use of artificial heat. I should advise you, however, always to stain your specimens while they are exposed, in an incubator of some kind, to a temperature of 98° to 100° Fahr. Want of attention on my part to this important point caused me much inconvenience when the cold weather set in last autumn.

"The process I have just described to you occupies some time. It has, however, certain advantages. Not only does it ensure thoroughly good staining of the bacilli, but the specimens, while being stained, may be safely left for from half an hour to ten hours, or even longer, in the fuchsin and anilin mixture, just as the experimenter finds most convenient. There is, however, a more rapid way of staining. The same staining fluids are used. A little of the fuchsin dye is filtered into a watch-glass, the specimen to be stained is placed in the fluid, and heat is applied. I have been accustomed to apply the heat by lighting a Bunsen burner, not at the top of the funnel, but at the burner itself. The heat, of course, passes up the Bunsen funnel, and so reaches the watch-glass, placed at a convenient height upon a tripod. I find that one minute's exposure to the action of the staining fluid, under these conditions, is sufficient to ensure excellent coloring of bacilli in sputum or in pus. The rest of the process is identical with that I have already described to you. Following this plan, it is easy to stain, and examine with the microscope, a specimen of sputum within ten minutes' time. Most of the specimens of the tubercle-bacillus in sputum and in pus which you see here to-day, have been prepared in this rapid way. In speaking

of these staining fluids, I have called the red dye fuchsin. That is the name in use on the Continent for the coloring matter which in England we call magenta."

Since practice alone can enable one to recognize the bacillus when he sees it, and since no wordy description could convey a true likeness of it, we would advise those of our readers not already familiar with it, to seize the first opportunity to visit some microscopist and familiarize himself with the appearance of the bacillus.—*Editorial in the Philadelphia Medical and Surgical Reporter.*

The Microscope in Medical Gynecology.—The importance of the use of the microscopic investigations in gynecological medicine cannot be over-estimated; often as a means of differential diagnosis it will be found of immense value; in fact, there is nothing to supply its place. Many physicians are deterred from using the microscope by the erroneous idea that an elaborate instrument is necessary, and that much erudition is a prerequisite. This is a great mistake, and comes first of too much reading of over-crammed books, which serve rather to befog and mystify their readers than to symplify and elucidate the subject in hand; secondly, it is the result of a want of a practical effort to acquire knowledge by experience rather than by hearsay, which begets an unhealthy dependence upon the opinions of others, and stunts the growth of and desire for original investigation.

For clinical microscopy no great depth of learning nor an intimate acquaintance with fine spun theories is required, but a plain, practical knowledge of the names and appearance of a few of the forms which the microscope reveals. It is not necessary to know what every thing seen in the microscope is; it is sufficient to know what it is not. Just as it is not necessary to be an accomplished botanist to distinguish an oak tree from a turnip, or to be a deeply learned naturalist to tell a horse from a goat, so it is unnecessary to be a thorough pathologist to be able to make good use of the microscope for clinical purposes.

To examine the secretions and the excreta, the ability to recognize a few dozen forms, is all that is required to commence with, and increased knowledge comes unconsciously with practice. Of course the more extensive the acquaintance with the various microscopic forms the less liability there is to mistakes, and the greater the power and accuracy of the microscopic analyst will be.

A lady applied to me to be relieved of most troublesome dysuria with which she had been annoyed for years without any benefit from the many treatments she had undergone at the hands of numerous physicians. She had also a slight vaginal discharge, and upon examination a chronic thickening of the urethra. The constant irritation had reduced her very much. Digital and instrumental examinations failed to reveal sufficient cause for such a grave condition as was evidently present, but a microscopic examination of the vaginal and urethral secretions demonstrated the presence of a great number of a species of the trichomonas vaginalis. Based upon this examination an insecticide douche was prescribed, with the result of relieving all the prominent local symptoms in a few days; of course the physical and constitutional consequences of such long continued local irritation required other and more patient treatment.

In another case in which the patient applied to be treated, for what she thought to be an old standing disease, I found by microscopic examination the whole trouble to be caused by another variety of the same minute organism. A course of treatment similar to that adopted in the former case resulted equally as well.

It is unnecessary to multiply cases. These two fairly illustrate the value of the microscope in this class of complaints. But for it I, too, might have blundered along in the course pursued by others who had treated these cases. Success in diagnosis and in treatment comes not always of genius, but of the possession of improved means of investigation, and of the patient, constant, conscientious employment of them.

Microscopic Examination of the Blood.—In the examination of the blood a field of investigation of great promise has of late years been opened up to ardent and persevering clinical microscopists. While from my own personal observation I am as yet unable to confirm all that has been claimed for the microscopic examination of the blood in diagnosis, I can positively state that this pursuit has proved of great value to me, and I feel amply rewarded for the time, trouble and expense which I have devoted to the study.

In America and in Europe there are quite a number of earnest hœmatologists, and there is every reason to hope that the time is rapidly approaching when the microscopic examination of the blood

will be universally regarded as a powerful aid to the diagnostician; meanwhile I would bespeak from the profession of Georgia a more lively interest in the use of the clinical microscope.

As a rule I examine the blood of all my patients, and I hope at some future time to give some of the clinical results of these observations, but in the meantime would refer my readers to special works on the subject. The study of certain diseases in this connection, such as consumption, syphilis, etc., has been to me a subject of special interest. Occasionally, that is in some specimens of blood, I meet with a red corpuscle, which becomes crenelated long before the others, and has an independent motion, twirling first in one direction and then in another, rotating and vibrating with movements not unlike that given by a squirrel to a nut which it is nibbling. What is the cause of these movements I am unable to say. I have thought it might be due to a bacterium, but my instrument is not of sufficient power to solve the problem.

Up to this time I have not found these moving corpuscles except in the blood of syphilitic patients. I do not wish to be understood as saying or proposing this as a sign or one of the signs of syphilis, but only say that I have not yet found it outside of those persons having a syphilitic history.

A patient, married, who had been for some time under treatment for uterine displacement, and who never had the least abrasion, nor any thing simulating a primary sore, nor yet even a vaginal discharge, consulted me for, as she expressed it, "falling away, being weak and out of condition." Her complexion was sallow, temperature two degrees above normal; pulse 102; loss of appetite, thirst, general malaise, but no defined pain; small, round, brownish spots appeared all over the limbs and body. These spots would sometimes subside, appearing pale pink under the skin. There was slight sibilant ronchus in the right lung. The urine presented no special abnormality.

The examination of the blood showed an unhealthy condition of the red corpuscles, and the moving vibrating corpuscles spoken of elsewhere; moreover I found the bodies named by Salisbury—crypta syphilitica. Under these circumstances I had no hesitation in placing her on an anti-syphilitic treatment. The subsequent progress of the case fully corroborated the correctness of the diagnosis. This case I may lay before the Association on some future occasion in its details.

NEW SLIDE FOR THE MICROSCOPE.—For the application of chemical tests to fluids under microscopical examination; the "pillar slide" presents many advantages. The method usual in such cases, is to place a drop of the reagent at one edge of the cover, and a bit of blotting paper at the opposite edge, with or without a hair inserted between the cover and the slide to facilitate the inflow of the reagent.

If the circular pillar slide be used, then the cover must be pushed so that all the space is on one side, there will thus be formed a crescentic instead of an annular space. It is evident that in the latter, if the space is filled with reagent it will affect the film, but slowly, because evaporation takes place from the reagent itself, and there is nothing to draw it between the cover and the pillar. In the round pillar this is best corrected by having the diameter of the cover smaller than that of the pillar, and pushing it to one side so as to project a little beyond the pillar, the lunate space thus formed is filled with reagent, while the rest of the edge of cover is evaporating and drawing upon the reagent to supply the deficiency thus created, or, to hasten to the reaction, a bit of blotting paper may be applied in the usual way.

Another good way is to use a square cover, let one of the corners project beyond the pillar, and under this corner put the drop of reagent, in this way nearly the whole of the edge of the cover will be left free for evaporation, and the rapidity of the reaction will, of course, be proportionately great. If desired, a different reagent may be placed under each of the four projecting corners of the square cover.

The "square-pillar slide" seems, however, best adapted to this class of work, with a cover the same size or smaller than the pillar, and projecting a little beyond it; the reagent will then occupy one side of the square and evaporation go on from the other three sides. If an oblong cover is used which projects on opposite sides of the pillar, then the same or different reagents may be placed on opposite sides of the same specimen, without danger of mixing with each other.

TALMAGE ON DOCTORS.—Encourage all physicians. You thank him when he brings you up out of an awful crisis of disease; but do you thank him for treating the incipient stages of disease so skillfully that you do not sink as far down as an awful crisis? There is

much cheap and heartless wit about the physician, but get sick and how quickly you send for him. Some say doctors are of more harm than good, and there is a book written entitled "Every Man His Own Doctor." That author ought to write one more book and entitle it "Every Man His Own Undertaker." Do you think physicians are hard-hearted because they see so much pain? Ah, no! The most eminent surgeon of the last generation in New York came into the clinical department of the New York Medical College when there was a severe operation to be performed upon a little child. The great surgeon said to the students gathered around: "Gentlemen, there are surgeons here who can do this just as well as I can. You will excuse me, therefore, if I retire. I cannot endure the sight of suffering as well as I once could." There are so many trials, so many interruptions, so many exhaustions in a physician's life that I rejoice he gets so many encouragements. Before him open all circles of society. He is welcomed in cot and mansion. Children shout when they see his gig coming, and old men, recognizing his step, look up and say: "Doctor, is that you?" He stands between our families and the grave, fighting back the disorders that troop up from their encampments by the cold river. No one ever hears such hearty thanks as the doctor. Under God he makes the blind see, the deaf hear, the lame walk. The path of such is strewed with the benedictions of those whom they have befriended. Perhaps there was in our house an evil hour of foreboding. We thought that all hope was gone. The doctor came four times that day. The children put aside their toys. We walked on tip-toe and whispered, and at every sound said, "hush!" How loud the clock ticked, and, with all our care, the banister creaked. The doctor stayed all night and concentrated all his skill. At last the restlessness of the sufferer subsided into a sweet, calm slumber, and the doctor looked around to us and whispered: "The crisis is past." When propped up with pillows the sick one sat in the easy chair, and through the lattice the soft south wind tried hard to blow a rose-leaf into the shaded cheek; and we were all glad, and each of the children brought a violet or a clover-top from the lawn to the lap of the convalescent, and little Bertha stood on a high chair with the brush smoothing her mother's hair, and it was decided that the restored one might soon ride out for a mile or two, our house was bright again. And, as we helped our medical adviser into the gig, we saw not that the step was broken

or his horse sprung in the knees. For the first time in our life we realized what doctors are worth. In some of our minds among the tenderest of all memories is that of the old family physician.—*The Clinical Brief and Sanitary News.*

Leukaemia and Pseudo-Leukaemia.—Professor Senator presented to the students in his clinic in Berlin, two very interesting cases. They were twins, æt. 1½, born of healthy parents, nursed by their mother up to their 14th month, and later fed mainly on cow's milk. The children were perfectly well up to their 17th week, when they commenced to get sickly. In both a moderate degree of rachitis developed itself. Very remarkable was the extraordinary pallor of their skin in connection with their greatly hypertrophied spleens. On examination of the blood, it was found that in both the white globules were decidedly augmented; in the one child there were five, in the other two and a half times more white corpuscles than red. Whether in these cases there existed the disease of leukaemia or pseudo-leukaemia, does, according to Senator, by no means depend upon the relative increase in number of the white globules; as many cases are on record where they are not increased at all, or only very little, and notwithstanding the case runs the same course as one of leukaemia. Besides, the relation of the number of globules to each other changes more and more with the progress of the case, as was noticed also in the twins; a few weeks later the ratio was already in one that of 1:50, in the other that of 1:45.

Leukaemia, which is better recognized by this peculiar tendency of the white globules of continuously increasing their relative number, is, according to Senator, not any rarer in children than it is in adults. Hereditary causes here had no influence, the less, as the children were all perfectly healthy and the parents too. The rachitic process could not have exerted any special influence on the peculiar composition of the blood, as it was one of very mild degree only, and as, notwithstanding the latter disease is an exceedingly common one, these are the first instances on record that genuine leukaemia had complicated rachitis. While Senator himself admits that he at present has no theory to offer as yet, to explain the pathogenesis of leukaemia, he believes that there are other factors at work, of which we do not possess any knowledge, and which can be elucidated only by carefully reporting all cases which have any bearing whatever on the question.—*Editorial in Med. and Surg. Reporter.*

Items.

Impromptu Condenser.—Prof. Rinefleisch suggests that the absence of a condenser may, on emergency, be supplied by a drop of distilled water placed on the lower surface of the slide, where it will act as a convex lens.

Potted Meat.—A dealer in potted meat in Bradford, England, has been committed to prison for two months, for preparing for food thirty-six pounds of horseflesh. He purchased a quantity of cat's meat at a penny a pound, and an inspector found it stewing in a pan with a few pounds of pigs' heads.

The Parasite of Malaria.—The observations of M. Richard seem to affirm those of Leverau; he found in the red corpuscles of the blood of persons suffering from acute malaria, a parasite of oscillating form moving very rapidly, and sometimes disengaging itself from the globule. These parasites have been met with in a number sufficiently large to obstruct the capillary vessels, and to explain many of the symptoms of intermittent fevers. It has also been proven that the culture of these parasites in a fertile gelatine basis can be brought to an immediate cessation if a two per cent. quinine solution is added.

Slides with Hollows for Chemical Reactions.—Many of the advantages of the pillar slides for the observation of chemical reactions may be obtained by using polished glass slides with one or more hollows.

In using these the drop of fluid to be examined is placed by the side of the hollow, or between them, if there be two or more, and the cover is allowed to project over the hollow or hollows a little distance; under this projecting edge the drop of reagent is placed, and the bit of blotting paper may be used as usual upon the slide if desired.—R. J. Nunn, M. D., Savannah, Ga., extracts from his paper before the State Microscopical Association of Georgia.

E. B. Tylor in *Nature* says that the microscopic examination of the cross section of a single human hair is sufficient to determine to which one of the race divisions of humanity the wearer belongs. If examined microscopically by Pruner's method, it shows circular, or

oval, or reniform; its follicle curvature may be estimated by the average diameter of the curls as proposed by Moseley; its coloring matter may be estimated by Sorby's method. There has been even a systematic classification of man published by Dr. W. Muller, of the Novara Expedition, which is primarily arranged according to hair, in straight-haired races, curly-haired races, etc., with a secondary division according to language.

First Idea of the Telephone.—The following lines, brought to the attention of M. de Parville by Prof. Egger, are extracted from the book "Incredulité et Mescreance du Sortilêge," by P. de l'Ancre, published at Paris in 1662. De la Diviniation, 5 teme traité:

"It is reported that a German communicated to King Henry the Great an astonishing secret, through which men far apart might understand each other by means of the magnet. He first rubbed together (frotta) two magnetic needles, and then attached them separately to two clocks, about the dials of which were written the twenty-four letters of the alphabet. When one needle was moved to a letter of the alphabet the other, no matter how far away, moved to the same letter. The King, perceiving how dangerous the secret might become in transmitting information to beseiged cities, forbade its publication."

The Presence of Bacillus Tuberculosis in an Abscess Near the Anus.—Dr. Robert C. Smith writes in the *British Medical Journal:* Six months ago, a young clerk, aged 21, came under treatment for hæmoptysis and other signs of phthisis. After about three months' treatment he became strong enough to resume his employment, at which he continued up to the commencement of this month. I saw him on the fifth, when he was suffering acutely from an abscess in the neighborhood of the anus; and, fearing lest it might burst into the bowel and give rise to a painful blind internal fistula, I opened the abscess at once and let out a quantity of thin, curdy, fœtid pus. A microscopic examination of this fluid by a half-inch object-glass, after the usual process of staining, revealed the presence of great quantities of well-marked typical tubercle-bacilli. Now, the presence of these organisms in this situation is interesting, as they tend to throw some light on the well-known connection between fistula and phthisis.

Carlyle's Triumph Over Difficulties.—In a strong and entertaining view of Carlyle's life and character, John Burroughs says, in the Midsummer (August) *Century:* "Carlyle owed everything to his power of will, and to his unflinching adherence to principle. He was in no sense a lucky man, had no good fortune, was borne by no current, was favored and helped by no circumstance whatever. His life from the first was a steady pull against both wind and tide. He confronted all the cherished thoughts, beliefs, tendencies, of his time; he spurned and insulted his age and country. No man ever before poured out such withering scorn upon his contemporaries. The opinions and practices of his time, in politics, religion, and literature, were as a stubbly, brambly field, to which he would fain apply the match and clear the ground for a nobler crop. He would purge and fertilize the ground by fire. His attitude was at once, like that of the old prophets, one of warning and rebuking. He was refused every public place he ever aspired to—every college and every editorial chair. Every man's hand was against him. He was hated by the Whigs and feared by the Tories. He was poor, proud, uncompromising, sarcastic; he was morose, dyspeptic, despondent, compassed about by dragons and all manner of menacing forms; in fact, the odds were fearfully against him, and yet he succeeded, and succeeded on his own terms. He fairly conquered the world—yes, and the flesh and the devil."

The Pillar Slide—A New Slide for the Microscope.—Every microscopist knows the difficulty of estimating exactly the amount of fluid which will completely fill the space between a cover and the slide, and consequently a bibulant must be applied to absorb the excess almost always present. This takes a little time, which, to one who has many examinations to make, and who is otherwise pressed, is a matter of some importance.

The following is a description of a slide intended to obviate this difficulty:

Take a small, thick cover (round or square, as desired,) and cement it on the centre of a slide with Canada balsam. Let this harden thoroughly, so that the cover will not slip during warm weather, and also to prevent water insinuating itself between the glasses during the frequent washing to which it will be subjected. Of course it would be better to have these little pillars ground upon

the slides, but with care in using them the cemented ones will answer every purpose.

A drop of the fluid to be examined is placed upon the pillar just described, a cover larger than the pillar is placed upon it, when it will be seen that the excess of fluid flows into the annular space surrounding the pillar. Not the least advantage of this new form of slide is that evaporation takes place from the fluid in this annular space, and may go on for a long time without affecting the stratum under examination.

If desired, the annular space may be filled with oil, and evaporation thus be entirely prevented.

Fine Structure of Bone.—G. Broesike has published an extensive memoir on this subject (*Archiv. mikr. anat.*, xxi. 695), of which Eberth has published an abstract, here reproduced. The first part of the paper deals with the limiting-sheaths of the osseous canal system. The sheaths may be isolated by the action of acids on completely macerated bones. They are but slighly pliable, and reproduce perfectly the forms of the canal. They may be destroyed by certain reagents quicker than the basal substance of bone, from which they are therefore different, their substance resembling keratine in the author's opinion. The sheaths are wanting in embryonic and all young bone. The author speculates as to their origin: he thinks they must arise either as a precipitate from the lymphatic fluids, or else by decalcification of the basal substance. (Neither of these views appears probable.) The osseous corpuscles form a continuous net work by the union of their processes. These cells probably have no membrane, and the nucleus soon degenerates. With increasing age, the cells loose their process, and become jagged and smaller, so that there is a space around them; then follows fatty metamorphosis of the protoplasm, and finally complete fatty degeneration, of which the products may be reabsorbed. The author advances the (very probable) hypothesis, that the corpuscles are killed by smothering in carbonic acid, accumulated in parts of the bone remote from the blood-vessels. The basal substance consists of uncalcified gelatin, yielding fibrillæ, embedded in a calcified cement. The lamellæ are formed by primitive layers of fibrillæ, which do not intercross and intertwine, although the sets of parallel fibrillæ run in various directions. The author distinguishes between regular and irregular fibrillar tissue.—(*Fortschr. med.*, i. 10.)—C. S. M., in *Science.*

Reviews.

A Dictionary of Medicine, including General Pathology, General Therapeutics, Hygiene, and the Diseases Peculiar to Women and Children. By various writers. Edited by Richard Quain, M. D., F. R. S. Fifth edition. Illustrated. Pp. 1,816. $8.00. D. Appleton & Co.

As indicated by the title, this is, primarily, a dictionary of medicine. The several diseases are arranged in alphabetical order, and are fully discussed. The symptoms, course, duration, diagnosis, prognosis, and, lastly, the treatment, are all clearly and satisfactorily given. The value of the work is largely increased, owing to the fact that the more important diseases are described by writers who are specialists in that department. Such names as Clarke, Fox, Peacock, Green, Carpenter, Thompson, Brown-Sequard, Brunton, Cobbold, and nearly two hundred others, are seen in the list of contributors.

To give the reader an idea of the extent of the work, we notice five columns of solid type devoted to "Albuminuria," six columns to "Alcohol," nine columns to "Ascites," nine columns to "Chyluria," twelve columns to "Causes of Diseases," forty-six columns to "Diseases of the Heart," equivalent to one hundred pages of ordinary book matter. Twenty-eight columns to "Physical Examination." Nearly a hundred columns are devoted to "Diseases of the Spinal Cord," by Bastian. This shows that the important diseases are not lightly passed by, but are treated in a most satisfactory manner by those specially familiar with the subjects. We like the work because it is clear, condensed, and in a readily accessible form. It contains, in an abridged, condensed form, all the information at present available for the use of the practitioner. A few books every student of medicine *must* have, a dictionary of medical terms, an anatomy and a dispensatory. He cannot add to the list a more comprehensive work than the one before us. It does not take the place of special works, but until these special works can be procured, it will fill an important place in the library, for it is a library in itself. The printing and binding are very good indeed, and the book looks well on the shelf or table.

Examen Microscopico del Trigo y de la Harina. D. Fernando Arambune. Madrid, 1883. Figs. 50, pp. 106.

Especial notice is given in the preface of "the eminent professor

in the University of Michigan, Louisa Reed Stowell," and this preface is soon followed with over forty pages and as many figures from Part II. of Mrs. Stowell's contributions to structural botany, in Microscopical Diagnosis.

THE CHILDHOOD OF RELIGIONS. By Edward Clodd. Price 15 cents. No. 47 of the "Library of Science." J. Fitzgerald, Publisher, 20 Lafayette Place, New York.

The author treats of the origin and development of religious ideas among the principal civilized nations of ancient times, as developed by the researches of men of science. The work exhibits the perfection of literary style combined with profound scholarship.

TRANSACTIONS OF THE MICHIGAN STATE MEDICAL SOCIETY FOR 1883, held at Kalamazoo, Mich., May 9th and 10th.

RHODE-ISLAND TWENTY-NINTH REGISTRATION REPORT.

FIFTH ANNUAL REPORT OF THE BUREAU OF STATISTICS OF LABOR AND INDUSTRIES of New Jersey, 1882.

Over sixty pages are devoted to an illustrated article by Rev. S. Lockwood, Ph. D., on "The Oyster Interests of New Jersey." It brings the whole knowledge we possess about this valuable animal down to the present time, and it makes very entertaining reading for any one.

A DELICATE TEST FOR BLOOD. By Malcolm Leal, M. D. Reprint from the Homœopathic Leader, July, 1883.

DESERVED APPOINTMENT.—We are glad to see that Dr. Lewis M. Eastman, of Baltimore, Md., has been appointed "Professor of Microscopy" in the Baltimore Medical College. No better appointment could possibly have been made. Dr. Eastman has long been recognized, by microscopists all over our land, as a very skillful manipulator of the tube, an excellent histologist and an expert in the preparation of microscopic objects. The college has done well in securing his services in lecturing upon these departments, in which he is so well versed.—*Bistoury.*

AT THE DOCTOR'S EXPENSE.

A journal has been started in New York called *The Undertaker's Assistant.* Why not call it *The Physician* at once?

Lake Moosehicmagunticjocknahmakantajus, in Maine, wants to become a summer resort. The brakeman will begin to announce the name on leaving the preceding station. Do tell all the gynecologists.

While a doctor was visiting a woman in Rowlandsville, Pa., two children poured a pint of molasses into his silk hat, which he didn't notice till he put the tile on his head. Language cannot describe his feelings, but it is said that he will petition the next legislature to pass a bill making it a criminal offense for a child to be born under twelve years of age.

Old Dr. A. was a quack and very ignorant. On one occasion he was called by mistake to attend a council of physicians in a critical case. After considerable discussion, the opinion was expressed by one that the patient was convalescent. When it came to Dr. A.'s turn to speak, he said: "Convalescent! Why, that's nothing serious. I have cured convalescence in twenty-four hours."

A number of young men in Cincinnati have organized a society which they have called the "Drake Medical Society," in honor, doubtless, of some distinguished doctor of that name. The *Medical and Surgical Reporter*, however, cannot resist the temptation to say that this is an evidence of more *quackery* in the profession.

"Doctor," said the suave traveling representative of a wholesale drug house, "I would ask your attention to our preparation of burdock seed. Have you had any experience in the use of this drug?" "Experience in the use of the docks? Well, I should say I had. You can't teach me anything about docks; I know all about 'em—burdock, yellow dock, and—and—opodeldoc, and all the rest of 'em."

OUR ADVERTISERS.

We could not afford to publish an illustrated journal of forty-eight pages if the subscription list was our only income. Therefore, when you are about to purchase please consult our advertising pages and see if you cannot be suited. We propose, in each issue, to call attention to our advertisers in detail and let our readers know what they offer.

The house of H. R. SPENCER AND CO., of Geneva, N. Y., has just issued a new catalogue containing revised prices and a number of unsolicited letters from their patrons. Their new homogeneous immersion 1-10th is especially mentioned. Their 1-10th of 113° balsam angle is listed at sixty dollars, while the same glass of 125° is listed at eighty dollars. The list shows a 1-4th objective at 16, 30, 40 and 70 dollars. Price lists sent on application by mentioning this journal.

A friend of ours says that he invested ten dollars in F. W. MCALLISTER, of Baltimore, and received "a very good section cutter" and a first-class assortment of diatoms and algæ. Mr. McAllister is special agent for Gundlach's microscopes. He will promptly furnish circulars.

H. J. BROWN AND CO. are new advertisers with us, but they know where to put their money to the best advantage. Mr. Brown has made a specialty of surgical instruments for years and keeps a full stock on hand. He has an immense stock of glass slides which he offers at very low rates indeed. Get his prices on these goods. It is the best place to buy these goods in this city.

G. S. WOOLMAN, of New York, is a general dealer in microscopes. Besides a full stock of these goods he keeps on hand a fine lot of drawing instruments and necessary accessories. The microscope he offers on page 116 of his illustrated catalogue is a very good one for the general practitioner and the price places it within the reach of all. The turn-table No. 3763½ is a very comfortable arrangement, having the revolving-plate set *under* the hand-rest. Mr. Woolman kindly offers a catalogue of 200 pages free to subscribers of this journal.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

A HOMOGENEOUS immersion (works also dry, water or glycerin) 1-15, 180° adjustable, to exchange for a higher power. A. Y. MOORE, 57 Prospect st., Cleveland, Ohio.

FOR SALE OR EXCHANGE for objectives or accessories, one copy Carpenter's "The Microscope and its Revelations," also Dana's "Manual of Geology." Both books are new and latest editions. Cost $10.50. H. F. WEGENER, Denver, Colorado.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

FOR SALE.—One Tolles' 4-10 objective of 100° adjustable; also one 1½ inch objective of 23° by William Wales. Both made to order and first-class. A. L. WOODWARD, Syracuse, New York.

WILL EXCHANGE.—One copy of Leidy's Rhizopods of North America, for objectives or accessories. Address, C. H. STOWELL, Ann Arbor, Mich.

FOR SALE.—Two Oxy-Hydr. Projecting Microscopes—cheap. I. G. LANGGUTH, 133-135 Wabash Avenue, Chicago.

FOR SALE.—A Spencer ¼ 115° or will exchange for a wide angle ½. F. O. Jacobs, Newark, O.

I WILL exchange good, histological for other first class mounts. S. G SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

WILL exchange rubber cement for good slides. EUGENE PINCKNEY, Dixon, Ill.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

FOR SALE.—Mounts of renal tube casts and double-stained blood corpuscles. $1.00 per slide. A. Y. MOORE, 53 Prospect St., Cleveland, Ohio.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

WANTED.

To know *why* "Grey Beard" did not stop.
A specific for diatomonomania.
To see a worse section-cutter than Seiler's.
To know how to sharpen the knife for section cutting;
And how to keep the edge from getting rough.
To keep oil of cloves away from the tongue.
Fifty more names for our page of "Exchanges."

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND SCIENCE.

VOL. III. WHOLE NO. 17 | Ann Arbor, December, 1883. | No. 5

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Original Communications.

THE FAKIR AND HIS LITTLE FAKES.

FAKE NUMBER ONE.

A FEW days ago a friend who travels from the East, the land of light, and who is personally acquainted with almost every practical microscopist from Maine to California, dropped into my office with his cheery "howd'yedo?" and asked the address of a good gold-plater.

"I have here," said he, "the finest wide-angled" (I am not going to give the focal length, for fear of "locating" him) "that I ever saw. I prize it above everything, and I want to have it gold-plated. I have just plated it myself with silver, but of course that will soon wear off, though it is very brilliant now."

"How did you plate it?" I asked.

"Oh! I bought a bottle of plating fluid from a street-vender—gave him a dime for it—and it is really very good. It's astonishing how cheaply they sell that stuff."

Here he pulled out the case to show me that famous wide-

angled one—th, and after he had unscrewed the cover, gave the objective a vigorous wipe to restore its brilliancy.

How it *did* shine! Like a star of the first magnitude; but as soon as I saw it I exclaimed, "You have ruined it!"

"How so?" he asked in dismay.

"You have applied a preparation of mercury, and amalgamated the brass. In a few minutes it will crack all to pieces," said I. I thought it possible, however, to put the cylinder in the flame of a spirit-lamp and drive off a portion of the mercury, and thus decrease the brittleness of the amalgam, and proceeded to try it. But even while I prepared the lamp the objective commenced to disintegrate, and soon that wide-angled one—th was a heap of ruined amalgam.

This is trick (or *fake*, as it is technically called in the *argot* of the noble brotherhood of fakirs) number one to which I wish to call the attention of microscopists. Those innocent little ten cent bottles of "magic plating fluid" have ruined many a valuable bit of brass and copper work. I remember a half-dozen instances, within my own ken, where the damage could not be repaired for fifty dollars. Let every reader of The Microscope beware of them. In my opinion there is hardly any metal handsomer than well-polished and lacquered brass, but if you must plate your instruments the following formula will give you a really good, genuine silver plating fluid:

Dissolve 50 grains of crystallized silver nitrate in an ounce of distilled water. In a separate vessel dissolve 100 grains of potassium cyanide in 2 ounces of distilled water. Mix the two solutions slowly, stirring with a glass rod. In still another vessel dissolve 50 grains of common salt (sodium chloride) in 5 ounces of distilled water, and when the solution is complete add to it the solution of silver cyanide. This fluid should be kept in an orange-colored bottle (though if the chemicals and water are all *pure*, this precaution is not necessary), and well stoppered. It will silver any metal in ordinary use. Iron or steel, to be silvered evenly and firmly, should be dipped for a minute in a bath of nitric acid of 1.2 Beaumé, and rinsed in distilled water immediately before being placed in the silvering solution. Bear in mind that, to get the best results in this, as in every other process, absolute cleanliness is necessary. If you wish a silvering fluid for brass or copper only, the addition of the sodic chloride is not essential, and, in its stead, common precipi-

tated chalk or Spanish whiting may be added until the solution is of the consistency of thin cream. This must be applied with a rag, rubbing the object to be silvered hard and thoroughly. The fluid is highly poisonous, and should be handled carefully. Another good silvering compound, non-poisonous, is as follows: Silver nitrate, 30 grains; common salt, 30 grains; cream tartar, 200 grains. Mix and keep dry. When required for use, moisten with distilled water or rain water, and apply with a rag. A little Spanish whiting improves this—cleaning the surface to be silvered.

"FAKE" NUMBER TWO.

"Right this way, ladies! Here's your fine ak-reu-matock duplex mickryscopes! Magnifies five hundred times and shows the annymalkewls in water. Here they are, my little miss, all a wrigglin' and a squirmin', and right out of pure Mississippi water! Only a dollar apiece!" and the Fakir was doing a land-office business with the little misses around him.

He had a stand at the Fair ground during the great October Fair—an occasion which frequently brings a hundred thousand people a day out to the beautiful Zoological garden where it is held. His stand was ostentatiously labeled "Display of Optical Instruments," and the "display" consisted of a score or more of the little magnifiers consisting of two cheap lenses, one of two and the other of a half-inch focus. They cost at wholesale three dollars a dozen. He was retailing them at a dollar apiece as fast as he could hand them out.

Forcing my way through the crowd around him, I asked to see the "animalcules in water" (the thing that almost everybody who knows nothing of microscopy asks on seeing a microscope). Instantly he dipped an innocent-looking tooth-pick in a glass of water, smeared it on the face of the smaller lens and gave it to me with instructions to hold it against the light and look through it. I did so, and was surprised to see the field literally covered with *anguillulæ*—paste eels!

"And are those the animalcules of water?" I asked.

"Yes, siree! All water is full of 'em. If you think that I'm jokin', why just take this clean tumbler and fetch some water from the bar, and try it agin."

I took the glass, rinsed it out carefully, and filled it with ice-water, fresh from the filtering apparatus.

Again he stuck the tooth-pick into the glass, smeared the lens, and lo! a host of paste eels again.

I wiped off the lens, took my finger and dipped a drop of water up and was about to smear it on the lens, when the Fakir said:

"Now, then! sir, move on. *You* don't want to buy, and are taking up the room of them that do."

I "moved on," but not until I had seen him dip the tooth-pick in a pot of sour paste under the stand and freshly charge it with eels. While I stood there he sold not less than twenty "'scopes," as he elegantly termed them, and every one of them on the strength of the "fake." The animalcules in the water did the business.

Among the purchasers was a "gray" of the most pronounced type, but dressed up to the nines in illy-fitting store-clothes. He was a "country doctor," in town to see the sights. After looking at the squirming eels he informed the Fakir that he was in need of an instrument to examine urine, and judging from the clearness with which that showed the water-bugs, it was the very thing he wanted. He got it, and I fancy that I can see him now finding spermatozoa in urine, and filaria in blood. He will have no end of "bacteria" in his conversation for the next six months.

Chance has favored me this evening, since writing the above, with a conversation with the Fakir. In fact, to my astonishment, he has just paid me a visit at my office and made a clean breast of the matter. He introduced himself by saying that he had sold 'scopes in every city and town of any size in the country, and that I was the first person who had detected the "fake" which made his instruments sell. His conversation was so interesting that I must reproduce a portion of it, at least.

"There's five principal men," said he, "who make a regular business of traveling over the country with 'scopes for sale on the streets. There is one boss man—the feller that invented that "fake," and he has the secret of how to make that stuff. He has sold it (the secret) to the other four, getting from twenty to fifty dollars apiece from them for the receipt of how to make it. I don't know the secret myself. Most of us get a little of the stuff from him to start with, and then we keep it up by adding sour paste to it from time to time. One time mine give out in San Francisco, and I had to send to Pittsburg, Pa., for a fresh supply."

"Pooh-pooh!" said I, "what nonsense! Why, *all* sour paste

contains it. I can tell you in a minute how to make it"—and I actually thought I could.

"Well, Doc.," (he grew very familiar all at once) "well, Doc., if you *do* know and *can* tell me, you'll be doing a mighty big favor to a poor fellow. *He* (that is the 'boss' chap) won't sell me the secret at any price, and I would like mightily to have it."

"Nothing easier," I answered, and proceeded to look in my *Index Rerum* for Paste Eels. I found several references; but the most promising was to the American Journal of Microscopy for September, 1878, p. 210, "Paste Eels, How to Raise Them." When I read it, I was not so confident as I had been. In fact, it quite took the conceit out of me.

The writer of this article states, in effect, that all sour paste does not contain the eels. That he had experimented a great deal trying to raise the little creatures, and had never succeeded in getting them *unless he had some to start with.* He once took a pot of paste and placed it in the midst of several other pots that were swarming with them, and left it there until it passed through all stages of fermentation and decay, and not an eel showed itself in it. He surmises, finally, that in those cases where eels had appeared spontaneously in paste they were originally in the water used in making it. This is in answer to a correspondent who inquires how to raise paste eels.

Now, having told my story, is there any reader of THE MICROSCOPE who can tell me the boss Fakir's secret? He sells a fluid to some of his agents, so *my* fakir tells me, which, when poured into any rye paste, soon fills it with *anguillulæ.*

FRANK L. JAMES, M. D.,
201 N. 6th Street, St. Louis, Mo.

RESOLUTION OF AMPHIPLEURA BY SUN-LIGHT, MIRROR-BAR CENTRAL.

BY H. J. DETMERS, M. D.

SOME time in the latter part of last winter, when I happened to be at home, Professor Burrill came to me with a letter from Professor Forbes, of Normal, stating that he, Professor Forbes, had so excellent an objective, a new, homogeneous immersion $\frac{1}{10}$ of

Spencer, that it would resolve amphipleura pellucida in balsam by central sunlight. We both, Professor Burrill and myself, ridiculed the idea, and concluded Professor Forbes must have some diffraction lines, for we both knew that he was not then familiar with the appearance of amphipleura. But the next day Professor Burrill came with another letter from Professor Forbes, which stated, the resolution had been effected with the mirror-bar central, but *with the light thrown a little to one side*, so as to make it bearable to the eye; also, that the field, thus illuminated, had presented a yellowish tinge. After Professor Burrill had left I observed that the sun shone in through the southern window of my room on my working table, and I concluded to try the effect of the light as arranged by Professor Forbes. So I took out my Bullock's biological stand, the same kind of stand used by Professor Forbes, and put on my $\frac{1}{10}$ Tolles homogeneous immersion objective, made in 1879, (n. a. about 1.33), and Moeller's balsam test plate on the stage. I focussed an amphipleura and arranged the light according to Professor Forbes' direction, that is, threw it sufficiently to one side to make it bearable, or easy, to the eye. To my astonishment the well-known lines presented themselves more distinctly and more beautifully than I ever had seen them before. The appearance of the frustule, as seen, may be compared with that of a new file. A one-inch eye-piece, by Tolles, was at the upper end of the tube. At first, of course, I was at a loss to explain such an unexpected result, and momentarily forgetting that the angle of incidence and that of reflection are invariably the same, I thought of several impossible things, for instance, a reflection from the lower surface of the objective, or from another diatom, but soon found that such could not be the case. Being well aware that I had *extreme* oblique illumination, the thing became interesting, and I kept on experimenting till I learned the true cause, and found that *the resolving rays are reflected from the* (*externally convex*) *internally concave surface of the edge of the immersion fluid.* The latter consisted of a concentrated solution of cadmium chloride in glycerine. The accompanying drawing, though poorly executed, may serve to illustrate. My attention was drawn into the right direction by finding that the resolution disappeared whenever too much immersion fluid was used, or whenever the immersion fluid became smeared all over the cover; in other words, whenever the outline or edge of the immersion fluid failed to

form a convex (internally concave) surface. The resolution, as any one can easily convince himself, is principally effected by a very oblique ray of light striking the object (very obliquely) from above, as shown in the drawing by the lines, marked a, a, so that if all other rays, those indicated by the other lines, marked b, b, b, and the diffused light in the room could be excluded, the field would present a dark ground illumination.

I communicated my discovery, if such it can be called, to Mr. R. B. Tolles, and he fully indorsed my views, as the accompanying letters from Mr. Tolles will show. Still, he too, makes a trifling mistake in assuming that the curve formed by the edge of the immersion fluid will be much flatter than represented in my drawing; if it is much flatter, the resolution, as will be easily seen, will be effected by a line more central than shown in my drawing, which, by the way, is the same I sent to Mr. Tolles in explanation of my find. The flatness or steepness of the curve formed by the edge of the immersion fluid depends upon the stiffness of the fluid, the amount that is used, and, above all, upon the working distance of the objective. If the latter is rather short, like that of my $\frac{1}{15}$ homog. immers, of Tolles and of my $\frac{1}{18}$ homog. immers, of Zeiss, even the curve formed by cedar oil is sufficiently steep to effect a most beautiful resolution in the way indicated in my drawing, if only the light is so directed that the edges of the same, as reflected from the mirror, will strike that curve. If one wishes to try the experiment, I would advise them to place the microscope in a position in which the direct rays of the sun cannot fall on the stage. What Prof. A. Y. Moore says in the June number of THE MICROSCOPE, about collar-correction is mere bosh to me, or at least too silly to deserve any reply, and his explanation given of the means by which the resolution is effected, unless intended as a joke, is untenable and contrary to all optic laws. At any rate the lower surface of all my objectives made by Tolles, Zeiss, Bausch & Lomb, and Hartnack, is well polished; that of my Tolles' $\frac{1}{10}$ is beautifully laquered and very smooth, that of the $\frac{1}{15}$ Tolles' is heavy gold plated, and perfect in its finish, and that of the Zeiss' $\frac{1}{18}$ is nickel, or nickel-composition, and exceedingly well polished. Neither of them contains convenient holes capable of reflecting the light where wanted.

In order to make Mr. Tolles' last letter, marked No. 2, intel-

ligible, I have to mention I proposed to Mr. Tolles that he should make a little ring-shaped lens fitting with its upper surface to the lower surface of the objective, encircling the setting of the front lens, and presenting in its outer edge the proper curve which would reflect the light coming from below very obliquely from above on the object in focus, and suggested that such a lens, if mounted in a brass, etc., frame, would probably very much facilitate the resolution. The latter indeed is most beautifully effected in the way described by any homogeneous, or even glycerine immersion objective that will at all show the lines of amphipleura by lamplight with Woodward prism or hemispherical lens, even if only after considerable waxing, provided the sunlight is reflected from the mirror in such a way as to strike the external convex (internally concave) surface of the outer edge of the immersion fluid, unless the latter is used too copiously, or smeared all over the covers.

Mr. Editor, I send you the above communication which is an extract of an explanation given at a meeting of our State Microscopical Society, at the express desire of some of my friends and members of the society.

Very respectfully,
H. J. DETMERS.

[The engraving for this article was not completed in time. ED.]

BOSTON, March 19, 1883.

My Dear Sir:

Enclosed please find letter sent for your perusal. I thought it might prove of some interest to you, and have borrowed it accordingly.

I don't think the position tenable, your explanation is no doubt correct.

Prof. Moore subsequently, in August, remarks that with the beam of light below the slide circumscribed to the glass of front opening the feat is impossible.

Yours very truly,
R. B. TOLLES.

CLEVELAND, O., May 13, 1882.

Dear Stodder:

* * * I have succeeded in resolving balsamed *amphipleura pellucida* by sunlight from central mirror with the following objectives:

B. & L., $\frac{1}{6}$ N. A. 1.43; B. & L., $\frac{1}{8}$ N. A. 143; Spencer $\frac{1}{6}$ N. A. 1.38, and Spencer $\frac{1}{6}$ N. A. 1.25. The light is condensed upon the front and radiated. Some strike the slide at more than 41° and enter the objective as very oblique light. I. E. S. evidently believed it to be genuine central light, but I can very easily demonstrate that it is not. He said that his Tolles' $\frac{1}{10}$ also does it.

Very truly,
A. Y. MOORE.

BOSTON, March 29, 1883.

My Dear Sir:

Your favors of the 21st to hand in due time. Certainly the large N. A., A, Y. Moore, adduces is not needed to show the brilliant lineation by central sun light, rather in the way, rather outside of what is reflected from the slide, lower surface totally, and reaching the balsamed object. I enclose your drawing and have pencilled the directions, first and secondary reflections of the ray. It is, you see, possible, but the film is, I suppose, of flatter curves than you have drawn.

You ought to announce the discovery, for it is a discovery, and I think very neat. As to its being a taking piece of apparatus, if made, I am somewhat doubtful. I wonder where you find the people who refuse to see the lines of A. pellucida, I thought the species extinct. If I get leisure to afford it I may try something. You plan should go well, with room to place the apparatus, a conical front. I think a balsam angle of 90° would do fairly.

I am, very truly yours,
R. B. TOLLES.

THE RESOLUTION OF AMPHIPLEURA PELLUCIDA—A REPLY TO DR. DETMERS.

BY A. Y. MOORE.

THROUGH the kindness of the editor of this journal, I have been permitted to read the proof sheet of the foregoing article by Dr. H. J. Detmers, and as some very peculiar ideas—ideas which seem totally opposed to facts or reason—are embodied in the article, I desire to say a few words upon the subject.

Dr. Detmers makes the statement, without qualification, that

my explanation of the course pursued by the rays of light in the resolution of *amphipleura pellucida*, as set forth in the June issue of this journal, "is untenable and contrary to all optic laws."

So far from accepting his opinion and agreeing with this statement, I shall now endeavor to show and *prove* that my explanation, as given in the June issue, is the only one which is *not* "untenable and contrary to all optic laws!"

Dr. Detmers states that under the conditions by which Prof. Forbes obtained the resolution—and which were subsequently successfully repeated by himself—the field had presented a yellowish tinge.

Now, I desire to have Dr. Detmers answer this question: In accordance with what law of optics, does a ray of sunlight become yellow, after having been internally reflected from a colorless, transparent medium!!

Had Dr. Detmers noticed the color of the field he would have seen that the exact tinge depended upon the color of the metal of which the front cell of the objective was made. That is to say, that if the front cell were made of red brass, the field would have had a dark yellow tinge; while if yellow brass or nickel it would have been a lighter yellow or nearly white.

Now, if the light were reflected from the edge of the drop of immersion fluid—as claimed by Dr. Detmers—what causes the change of color in the field when objectives of different colors of brass are used?

Yet Dr. Detmers positively states that such is the case.

The chief objection which Dr. Detmers imposes upon my explanation, seems to be that as the angles of incidence and reflection are invariably equal, the reflecting surface of the front of the objective does not present the proper angle to reflect the light upon the lower (internal) surface of the slide—where it is then reflected through the object and into the objective. But the only evidence presented in support of this point, is that the front of his objectives are well polished, beautifully lacquered, etc., and present no holes to reflect the light where wanted. Dr. Detmers seems to forget that opticians are not in the habit of putting a "perfect finish" to the fronts of their objectives, and I have never yet seen an objective which would not radiate (diffuse) light from its front cell. If sunlight be condensed upon the front of an objective, perpendicular to

its surface, a bright spot may be seen from almost any direction. This proves that the polish of the front is not perfect, and that the light is radiated. That the spot of light could not be seen when condensed upon a perfectly smooth surface, may be illustrated by condensing upon a well silvered *clean* mirror, a beam of sunlight and looking at it from various directions. When the eye is in the path of the reflected ray, it becomes visible but at no other position.

Dr. Detmers states that it is necessary that the immersion fluid should have an externally convex edge, the light being condensed by its inner concave surface *upon* the diatom!

In the first place, the resolution of a balsam mounted *amphipleura pellucida*, as an opaque object, is not easily done; and in the second place *it is not necessary that the edge of the fluid be limited by any particular form at all.* There should be enough fluid to cover that part of the front upon which the light is condensed and the light should be condensed upon such a part of the front cell that a line drawn from the spot of light to the lower surface of the slide and then up through the object into the objective, will form an angle of not less than 82°.

With the drop of homogeneous fluid forming an externally concave surface, the resolution can be easily obtained, and I have succeeded in obtaining excellent resolutions where the fluid was spread over the entire cover-glass, and, being plentifully supplied, covered nearly the whole surface of the front cell—the edges being externally concave and certainly not presenting the proper angle to reflect the light upon the object. Even if it could do so it would not be condensed at all and would therefore be of too low intensity to give the required resolution.

Some time ago, while using a Spencer $\frac{1}{25}$, it occurred to me to try a little experiment which would prevent any light at all from reaching the edge of the fluid. I selected a slide which had a heavy circle of black cement. A little fluid was put upon the cover and upon this was placed a thin piece of sheet rubber having a hole in the center a little smaller than the edge of the front cell. This was pressed down until the fluid extended *upon* the ring of cement, so that it would be impossible for direct light from below to reach the edge of the fluid. More fluid was then dropped upon the rubber and the objective lowered. The edge of the fluid between the rub-

ber and front cell was protected from the light by the piece of rubber, but, notwithstanding all this, the resolution was as good as before!

A few days ago I blacked the front cell of a Spencer $\frac{1}{10}$ with Chinese ink, and then getting the fluid into the position described by Dr. Detmers as most favorable, I tried to effect a resolution; but although the blacked surface radiated some light it was not sufficiently intense to enable *amphipleura pellucida* to be resolved!

I then took a piece of tin foil about an inch square and made a hole in it whose diameter, although slightly smaller than that of the front lens, was a little larger than its working diameter. This was placed upon the cover-glass and pressed down until the fluid extended to nearly the edge of the tin foil, the fluid being between the cover and tin foil. The hole in the foil was brought over the diatom and after applying a little more fluid above the foil the objective was lowered. The resolution was as good as before and the light was very white.

I have now presented a series of facts which substantiates my explanation as given in the June issue, and which shows the incorrectness of Dr. Detmers' theory. In fact, I have shown that while his theory is "untenable and contrary to all optic laws," my own is in perfect accordance with every law governing the reflection of light under similar circumstances.

I am surprised to learn that Dr. Detmers should regard the evidence of color correction as "mere bosh" in regard to central or oblique light, and as he has made the statement that it is so, I should like to have him explain *why* it is so, and I will endeavor to prove the incorrectness of that supposition also.

PRACTICAL HELPS.

BY E. H. GRIFFITH.

THE following may be of interest and of value to some of the readers of the MICROSCOPE:

RINGING SLIDES.

Delicate colored circles may be made with a pen and aniline inks on slides finished with white zinc. Center the slides on a turntable and hold the pen in the same manner that a brush should be held.

PHOTOGRAPH SLIDES.

A large variety of very beautiful photograph slides may be made for a small sum in the following manner: Purchase for one dollar a dozen a lot of the photograph charms such as are mounted in small ivory holders and intended for watch-chain charms. Remove the small lens from the ivory holder, and on examination it will be found that the photograph is on a bit of thin glass which is cemented to one end of the small lens. First place a tiny drop of balsam on a small cover-glass with the point of a needle and place the cover on one end of a strip of mica. Next take hold of the photograph end of the charm with a pair of tweezers, hold the other end for a moment in the flame of an alcohol lamp, and the lens part will drop off. Place the bit of thin glass, photograph side down, on the balsam on the cover, and move the mica slowly back and forth over the alcohol flame until the balsam becomes hard and the picture secure, taking care not to burn the balsam or to smoke it. Now prepare a cell with a curtain ring and white zinc cement and mount the cover in it. Finish in as ornamental a way as desired. The white zinc may be finished with the colored ink circles if desired. Asphalt, brunswick black or india ink may be put on the under side of the cover-glass next the picture after the balsam has been dried over a lamp, and neither one will run under the picture. Heat will not injure the photograph.

MOUNTS WITHOUT COVERS.

Many beautiful objects for the lower powers require no cells and no covers. Among them may be mentioned flower seeds, the head and other portions of the Spanish fly, etc. Place the slide on a turn-table and with white zinc turn a disk on the center and another with asphalt in the center of the white one. With a fine brush arrange flower seeds in any pattern desired by picking them up with the point of the brush after drawing it between the lips, then lay them down on the black center. When dry the cement will hold the objects in position. Few more beautiful objects can be found than the heads of Spanish flies, which may be procured at drug stores and mounted in the same way. The disks may be finished with colored rings if desired. No covers will be needed.

ARRANGING DIATOMS.

Those who wish to arrange diatoms will find the following of great assistance: With a pipette place the diatoms on a film of

mica, as the mica is very thin and when mounted can instantly be heated to an intense heat over an alcohol lamp. With a pair of scissors cut small strips from the best part of the diatom field of mica, moisten the mica on the other side and lay it on the prepared slide near the center of the slip to be used, or if the diatoms are to be mounted on a cover-glass, place the strip near it and with a pen make a delicate dot of ink on the under side of the slide to mark the place for placing the diatom. From the mica the diatoms can be very easily picked, while from glass it is sometimes almost impossible to pick them. Several strips of mica may be placed side by side with different kinds of diatoms if desired.

Those who desire to arrange diatoms will find the following suggestions of value: Instead of putting the diatoms on a cover-glass and the cover-glass on a metal strip, in order that organic matter may be burned away over a spirit lamp, put them with a pipette on the end of a thin strip of mica and then burn them, avoiding the great annoyance of having a cover-glass, diatoms and all, slide or fly off. The mica being thin and a poor conductor of heat, the end may be brought to a red heat almost instantly. Now place a glass slip on the turn-table and make a dot or a small circle in the center as a guide for placing the diatoms. Turn the marked side down and with gelatine or other material size the spot over the dot or circle; then with scissors cut from the film of mica a small piece from the best part of the diatom field, moisten the other side and lay it on the glass slide near the marked center. A crescent-shaped piece may be cut if desired that may extend partially around the marked spot. The mica being thin the focus of low powers need not be changed while transferring the diatoms from the mica to the slide, and one trial will demonstrate that it is much easier to pick from mica than from glass; also that there is less danger of having the mica fall from the slide while at work. Those who desire to make the arrangement on a cover-glass can do so by placing a cover over the marked center, sizing it and then transferring to the cover instead of to the slide.

Died, at his home in Boston, on November 17, 1883, Mr. R. B. Tolles. A full account of his valuable services to thescience of microscopy, will be given in the January number of this journal.

A NEW BACTERIUM.

BY J. M. ADAMS.

IT appears that a new bacterium comes into existence, a little different from the ordinary septic bacteria, at the close of decomposition, or, when organic infusions are being resolved into clear and odorless liquids with gray, inert powdery sediments which generally takes a year or two before this work is completed. This new form resembles the B. termo, but only about one-half its size, single celled, oblong and probably biflagellate. It is evidently not an impoverished form of the termo, for it is very active, generic of its own kind and actually consumes the termo which has up to this time done the principal work of decomposition.

Whether this bacterium can live at any other time is a question. It requires a clear, strong daylight and a short tube to be seen at all and for its peculiar lateness may have been unobserved.

GLEANINGS FROM THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY FOR OCTOBER.

BY C. H. STOWELL.

ASSYRIAN LENS.—Sir A. Henry Layard, in his "Nineveh and Babylon," describes a lens which he found in the course of his excavations and which is now in the British museum. It is a plano-convex rock-crystal lens. It was found buried beneath a heap of fragments of beautiful blue opaque glass, apparently the enamel of some object in ivory or wood, which had perished.

The length of the lens is $1\frac{6}{10}$ in., and its breadth $1\frac{4}{10}$ in. It is about $\frac{1}{4}$ in. thick. It is poorly polished and scratched. It gives a tolerably distinct focus at $4\frac{1}{2}$ in. from the plane side. In all probability this lens was used by the Assyrians for magnifying purposes.

THE COMPOUND MICROSCOPE.—Professor Heschl, of Vienna, found nine compound microscopes in Austria. One was made between the years 1760—90. It stands 32 cm. high and is provided with seven objectives and two Lieberkuhns. One instrument had a stage, 12 cm. by 9 cm., consisting of a lower plate carrying a wheel of diaphragms, and an upper plate sliding between two pieces supported on four short uprights. The eye-piece was Huyghenian and the mirror made of metal.

COLLECTING AND PREPARING INFUSORIA.—Dr. H. Fol discusses this subject in a lengthy article and concludes that the most valuable reagent is found in perchloride of iron. These subjects, washed in alcohol and treated with gallic acid, present a brown coloration, which is especially localized upon the nuclei, rendering them very visible; the other parts of the animal acquire a light-brown tint, which rendered them easy to see. They may be mounted either in Canada balsam or glycerine.

Mr. W. S. Kent has found potassic iodide almost identical in its action to osmic acid and has the advantage of yielding no deleterious exhalations. For preserving infusoria he uses the following: To a saturated solution of potassic iodide in distilled water, iodine is added to saturation. The solution is then filtered and diluted to a brown sherry color. A very small proportion only of the fluid is added to that containing the infusoria.

This October number is filled with matter of the highest value to all interested in microscopy. The departments of zoology, botany and microscopy are represented by one hundred and fifty pages of solid type. The price is five shillings per number.

NOTES ON HETEROPHRYS MYRIAPODA.

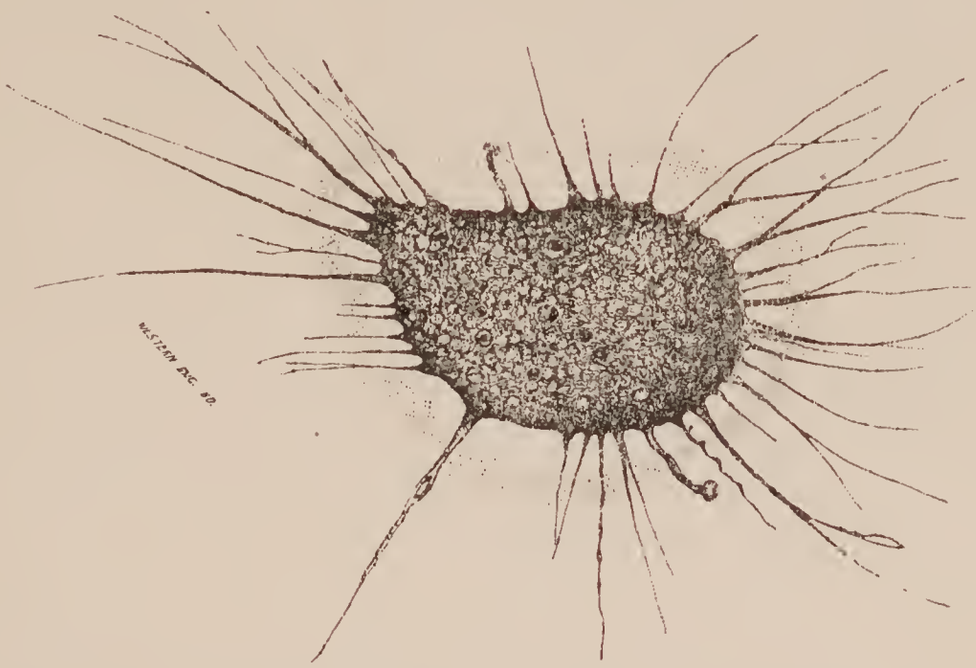
BY DR. ALFRED C. STOKES.

IT was with much pleasure that I recently noticed several individuals of the above named Rhizopod gliding about the meshes of a net-work of algæ on the slide. The pretty little mass of sarcode had previously come under my observation, but the instances had been few and far between, and my notes on the subject were scanty. Now, however, having accidentally captured the delicate creature in considerable numbers I hoped to compel it to answer certain queries.

The animal seems to vary much in size, those observed by Dr. Leidy measuring from $\frac{1}{380}$ to $\frac{1}{300}$ inch, those among my own gathering of algæ $\frac{1}{267}$ to $\frac{1}{445}$ inch, including the external protoplasmic layer, the thickness of which in one case was 0.00075, in the other 0.0005 inch. With these latter individuals the micrometer lines were brought across the Rhizopod after it had for some moments been motionless, although it seldom comes to a complete stand still. Yet as a rule its movements are slow; when it has failed

to force the soft and plastic body between two algous filaments, or between the cover and the water-weed it shows passion by a quick jerk of retreat and a sullen march in the opposite direction; under other circumstances it is not active.

It is not a mud loving Rhizopod as most of the shell-bearing forms appear to be. Indeed, are any of the Heliozoans, *Actinophrys*, *Actinosphærium*, *Acanthocystis*, fond of the ooze? They seem to delight in gliding across the lily leaves, through the matted tangle of filamentous algæ and among the dissected leaflets of aquatic plants. And my impression is that the mud-haunting propensities of the Protoplasta Labosa are more apparent than real. My own observations have taught me that *Difflugia pyriformis* pierces



the cell wall of *Spirogyra* and devours the contents; it is not improbable that the members of other species and genera have similar food habits. *Heterophrys* seems to feed chiefly on vegetal matters. I have not noticed it capture animal food, as I have seen *Actinosphærium* and *Acanthocystis*, but upon starch granules from a ruptured algal cell it fed greedily. To convey the grains to the body mass the pseudopods that seized them were not retracted, but the granules being surrounded by the sarcode were hurried back through its substance like a procession of submerged skiffs swept on by a rapid current.

The pseudopodia protrude themselves from any part of the body, but more abundantly perhaps from the two poles. They fre-

quently bifurcate, the branches crossing others without coalescing, probably on different planes, and extend to a distance equalling or twice exceeding the diameter of the body, then becoming extremely delicate. At times a furcated branch so fine that it is visible only on careful examination will writhe and twist and finally bend upon itself until the tip touches, when the sarcode drips rapidly down the pseudopod in minute beads. This beaded aspect is also noticeable in layer pseudopodia, the globules slipping down in quick succession without any apparent diminution in the size of the pseudopod; if an inner upward current was present it was invisible.

In addition to their use as purveyors of food and as locomotive organs, if they are employed for the latter purpose which is somewhat doubtful, they often have another function: that of lifting the excrementitious matters from the body through and beyond the enveloping protoplasmic layer. In many instances, two of which in the same individual are shown in the figure. I have seen small clusters of effete particles carried by a thick and tortuous pseudopod from the body sarcode beyond the layer of linear bodies on the surface of the protoplasmic investment and dropped clear. The larger food particles are enclosed within a vacuole whose fluid contents are seemingly in motion, as the food itself is variously turned about without contact with the body sarcode. When ready to be ejected the vacuole quickly disappears and the rejectamenta are shot out with some force, enveloped by a thick sarcode mass soon withdrawn.

Often for no visible reason a part of the animal becomes surrounded by an irregular secondary layer of the linear processes usually present on the surface. As the creature squeezes through a tight place they stream out behind as if about to part company with the host, but I have not seen any sever the connection. And what that connection is, whether it is more than a layer of structureless protoplasm I have in vain tried to determine. A careful arrangement of the light and a careful examination with a Spencer homogeneous immersion $\frac{1}{10}$ of August last have revealed no structure between the body sarcode and the villous exterior.

The contractile vesicles are several and irregularly placed near the margin. One pulsated four times in two minutes, another four times in two and one-half minutes.

One method of reproduction is by transverse fission. Of this

process I have seen only the termination. The partially separated animals when first observed were connected by a single broad band which quickly parted, the two ends suddenly flying apart as if strongly pulled in opposite directions. The Rhizopods then moved off as though nothing unusual had happened. They were nearly equal in size.

It would be interesting to know how long one *Heterophrys* takes to make of itself two.

DIFFERENTIATION OF BLOOD CORPUSCLES.

THAD S. UP DE GRAFF.

THE criticism, by Professor Stowell, in the October number of the MICROSCOPE, concerning the testimony given by myself in the Wellsboro murder trial, attributes to me certain assertions so at variance with what was really said, that I am unwilling to permit them to go unchallenged.

The first statement alluded to requires no contradiction among my friends, but, lest other readers of this journal should consider me the egotistic ass that such an utterance would proclaim one, let me inform them that I did *not* say that "there were but four men in the world who could tell human from dog's blood," and to which Prof. Stowell adds—"and, of course, he was one of them."

Secondly, I did *not* say that "on account of the superior character of his glasses and that his microscope cost sixteen hundred dollars, he could do much better than others."

Thirdly, my testimony did *not* "give a definite size to the human red blood corpuscle," any more than do the sizes quoted by Prof. Stowell from Gulliver, Flint, Dalton, Richardson, Woodward and other eminent gentlemen, give definite size or significance to the human corpuscle.

Since it is of trifling consequence to your readers, and none whatever to the theme under consideration, what I did say that admitted of such distortion as not to be recognizable, I will content myself with a simple denial of the utterances quoted and devote the space offered me to replying to the question: "Can human blood be told (distinguished) from that of the dog?"

My opinion is—be it modestly proclaimed—it can, beyond a reasonable doubt. I am apprehensively conscious of differing with

many eminent microscopists in making such a statement, knowing full well that my reasons and proofs will be demanded and tested ere I am credited. Let me give an outline of the methods employed in reaching such a bold conclusion, leaving the details of the experiments to be described hereafter.

If the blood stain offered for identification is deposited upon the polished surface of steel, iron, glass or wood, and the problem to be solved reduced to the single question—is this human or dog's blood?—excluding the blood of all other mammals,* the labor of the investigation is greatly simplified. If, however, as is usually the case with such examinations, the blood stains are presented upon fabrics of wool or cotton, the process becomes more tedious, but the results are scarcely less accurate or exact, provided the stain offers a sufficient number of corpuscles to complete the necessary experiments and are unmixed with chemicals or other extraneous matter likely to distort or destroy them.

Our experiments include a large number of methods and reagents for restoring dried corpuscles. Perhaps, the plan that affords as good results as any is the one as substantially recommended by Dr. Richardson, of Philadelphia.

If the stain for examination is deposited upon any of the smooth and hard surfaces first mentioned, a drop of a solution of bichloride of mercury† [½ of one per cent. solution] is deposited in the centre of the spot and stirred and scraped gently, with a cataract needle, the dried speck being broken up as finely as possible by means of the keen edge of the needle. Immediately this mixture is transferred to a half-inch cover-glass, first having breathed upon the glass, while it is held by forceps, and the breathed-upon-surface applied to the mixture. A sufficient quantity will adhere to the glass; but, should it fail in so doing, remove the drop to the cover-glass by means of a clean camel's hair brush. Invert the cover-glass to which the fluid adheres upon a slide. Then, apply a solution of eosine [five grs. to the ounce of distilled water] to the edge of the cover-glass. Touch the opposite edge of the glass with a piece of blotting paper, when, as the mercurial solution is removed, the staining fluid takes its place. Permit it to remain two minutes,

* It is presumed to be an admitted fact that the blood corpuscles of the horse, cow, pig, sheep and goat, being so much smaller than man's, their identification is easy of procurement.

† Dr. Richardson uses ¾ of one per cent. of common salt solution.

then, in turn, wash it out with the mercurial solution. Place a little oil around the edge of the glass, to prevent evaporation, when you are ready for inspection.

For restoring corpuscles found dried upon fabrics, much the same process is observed, save that the dried particles composing the clot are finely pulverized, by means of the needle, allowed to fall upon the slide, a cover-glass placed over them, the under side having been breathed upon, when the solutions are applied at the edge and allowed to run under by capillary attraction.

Does the clot, so prepared, contain human red corpuscles or those of the dog?

Place the slide under a good homogeneous immersion objective —a tenth or twelfth is recommended—and, with a one-half or one-quarter eye-piece, make your observations as follows:

1. Note the average size of the corpuscles.
2. The thickness of the cell-walls.
3. The expansibility of these walls.

Applying a good eye-piece micrometer—cobweb, preferred—being sure that the ruled spaces on glass or dial are evenly spaced, it matters not what the value, in parts of an inch or millimeter these spaces may be, nor whether the corpuscles measure $\frac{1}{3200}$ or $\frac{1}{4500}$ of an inch by any standard but your own. What do they measure, in spaces on your evenly ruled micrometer—how many spaces does the corpuscle occupy? Select one hundred of the roundest of them, and note carefully their value, in spaces, on your scale. If they do not fit a given number of your ruled spaces, lengthen or shorten your draw tube until an average number do fit. Make a record of these lines, length of draw-tube, eye-piece and objective used, and apply, afterward, the same conditions precisely, to corpuscles of known origin, that the difference may be noted. In the examination of human blood, you will find a few smaller corpuscles and a still smaller number of larger ones than the sample will average. Repeat your observations several times, finally compare your results with those obtained from previous examinations of the blood of human subjects, as well as of various dogs, under precisely similar treatment—the results having been carefully noted at the very instant the observations were made. Also compare the specimen under suspicion with that taken from several individuals and dogs,*

*I compare also with mounted slide of the blood of a large variety of human beings and dogs.

smeared upon the same garment or a similar fabric, restored by the same solutions, and treated, in every respect like the specimen to be identified.

You will readily discover the following facts: The human red corpuscles will average much larger than those of any dog. You will find some larger corpuscles in the dog's blood, and some smaller ones, too, than the average corpuscle in human blood. But, the largest corpuscle of the dog will rarely, if ever, be found as large as the largest of man, while the smallest will average smaller than the smallest of man.

You will also note that the cell-wall of the human corpuscle is much thinner than that of the dog and that the expansibility of the human corpuscle—when treated with pure water, instead of the saline solution—is much greater than that found in the corpuscle of the dog.

The human corpuscle will expand to the rupturing point and collapse much sooner than will that of the dog, when treated precisely alike.

Measuring the cell-walls of perfect corpuscles in man and dog, you will readily perceive that the latter is perceptably thicker than that of the former and that the corpuscle of the dog exhibits a peculiar toughness of cell-wall, difficult to describe yet always recognizable to those much given to their investigation.

Again, mounting three or more slides dry in balsam, from the specimen to be identified, and from your known specimens of dog and human blood—prepared and mounted precisely alike—upon very thin cover-glasses, place them under your solar microscope,† and, by means of a $\frac{1}{12}$ or $\frac{1}{16}$ objective, project them, 6 or 8 feet distance, upon a tightly stretched screen, in your dark room. Apply to these images upon the screen, a glass rule, divided into spaces of about $\frac{1}{64}$ of an inch when the difference in size of the corpuscles will become still more manifest by reason of the greater amplification while the cell-walls of the dog corpuscles will be seen to cast a heavier shadow than those of man.

"Where is the exact size to judge by?"

In reply, there is no exact size, nor is any needed, save that

†I use the McIntosh solar projecting apparatus, the same as exhibited in Chicago, at the annual meeting. The oxy-hydrogen light does not make the outlines sufficiently plain to permit of accurate measurements.

revealed by your own micrometer and your personal skill. A corpuscle measured by two different individuals, by different micrometers, will not likely report the same named portions of an inch, or millimeter. But, each observer will agree with his own measurements and will recognize them when applied to various specimens. Each will be able to declare for himself whether the blood submitted be that of man or dog, and they will agree perfectly, according to the tests here set forth, although they may record a different named size to the corpuscle.

To the quotation from Dr. J. J. Woodward, to wit: "The average of all measurements of human blood I have made is rather larger than the average of all measurements of dog's blood. But it is also true that it is not rare to find specimens of dog's blood in which the corpuscles range so large that the average size is larger than that of many samples of human blood:" I can only say that in a very extensive examination of the blood of the setter, pointer, spaniel, grayhound, rat-terrier, newfoundland, spitz, poodle, and the common cur—all treated in precisely the same manner and under the same conditions—I have never found a solitary instance where the red corpuscles averaged as large as those of man. Yet, I would not rely solely upon the size of the corpuscle, in determining whether it was from human blood or not, but accept it as one of the factors in such determination. In addition to the conditions that enter into the differentiation, and already foreshadowed, are the additional ones of the density of color, and the form of the crystals of hæmatin.

I will not weary you with the detail of experiments under this latter head and extend this, my preliminary article, that has already become too prolix. I did not intend to have written anything upon this subject until my investigations were completed, that I might support my statements with facts and figures gleaned from my laboratory note book, and should have adhered to that resolution but for the ridiculous position in which Prof. Stowell's article left me. By the time the winter is ended, I hope to be able to complete the work but now fairly begun; and, whether I succeed or not in making it possible—in every instance—and by every microscopist, to distinguish between the blood corpuscles of man and dog, I shall at least acquaint you with the facts gleaned from my honest endeavor.

Meanwhile, let us hope that there are more than four men in the world working industriously and faithfully at the same problem, and that none of them will be ridiculed or ostracized for the opinions they may advance, before the grounds upon which they base their conclusions are promulgated and dwelt upon. Then, should it come to pass that, in these investigations, the often expressed theories of favorite scientists should be opposed by new, demonstrated facts, why, so much the worse for the theories.

Perhaps I should heed the challenge of Prof. Stowell's article. Since I have already, in very numerous instances, submitted to the test he suggests, without once failing in distinguishing human from dog's blood, I see no good reason for denying him the pleasure of this little by-play.

One word with regard to the Wellsboro murder case, which has been so much referred to. The blood stains submitted to me for examination, were claimed by the prisoner, to be caused by the blood of a dog which he had killed the day before his arrest. No other animal was mentioned as a possible cause. The stains were liberal and an abundance of corpuscles obtained therefrom. By means of mounted slides of human and dog's blood, compared with similar slides of the suspected blood both by microscope and photographs, no difficulty was found in showing that the stains could not have been caused by dog's blood. Since his attorneys had an opportunity of examining and comparing the two bloods in the various ways mentioned, I was glad of the corroborative evidence on their part that induced the criminal to adopt the more plausable explanation of "nose-bleed."

NERVE-TERMINATIONS IN CELLS.

W. H. BIRCHMORE.

[Dr. Birchmore writes as a very long and careful letter on this subject and his conclusions are of sufficient interest to warrant their appearance here. We assume all responsibility in publishing a portion of a letter not intended for publication. The doctor's studies have been made on the lining membrane of the cornua of the uterus of the pig.—Ed.]

If you will look in Carpenter under intestinal epithelium you

will find a schematic cell. Now I think, I do not know, that there is some reason in that scheme. Pflüger goes into quite a discussion in nerve terminations, in Stricker, page 308, but there is in his own showing room for more study.

If you will look at my osmic acid preparation of the bronchial epithelium, you will find in some cells by oblique light and very cautious focussing a fine line which seems to connect the nucleus with the tissues beyond, and this fine line passes into one of the processes of the epithelial cell. I find it in by no means all cells, but sometimes I see it or think I do very plainly. Now in some of these lining membrane cells I think I see just such appearances. In many cells a long process is distinct, in some cases twice as long as the cell-body. There are also cells of connective tissue in connection with the other processes of the cell. I sketch cells and send them. It may be that my little drawings suggest Pflüger's, but all pictures of horses should resemble each other in having four legs. I know this is no Heitzman frame-work. It may be that I am mistaken but I think as I say. I am not fully satisfied, hence I ask you.

Also in the same mucous membrane there are cells above two diameters larger than the connective tissue corpuscles which send processes to the smallest capillary walls and communicate only with each other and receive the very finest nerve fibres. This I am quite certain of.

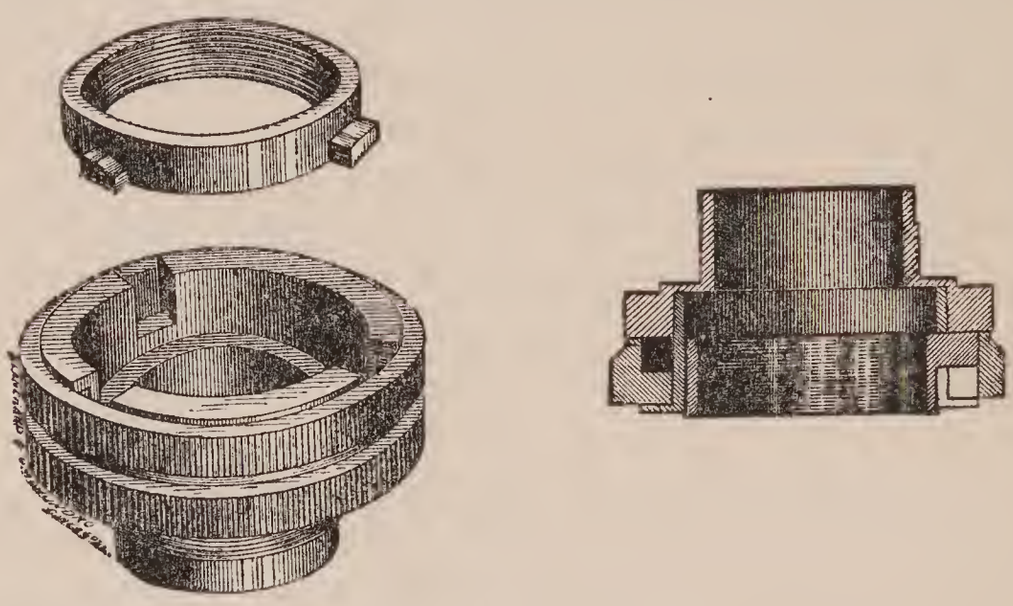
But to state my conclusions or rather lucubrations in a *pro forma* shape:

There is an epithelium lining the sow's womb made up of cells three to five times as long as broad, so set that seen from above, they resemble pavement cells. There is but one line of these cells. Some cells present ciliation, some cell contents and distinct nucleus, some both nucleus and nucleolus as well. Many cells can be traced as branched into communication with connective tissue corpuscles. There are certain cells of a type distinct from these presenting an open mouth. In these the cell contents is wanting. The nucleus stands free in these cells and presents a process which passes beyond the cell.

NEW CONGRESS NOSE-PIECE, PATENTED 1883.

BY W. H. BULLOCH.

THIS attachment has been designed to meet the requirements of the working microscopists for the rapid changing of objectives from one power to another, or for the comparison of objectives. All the nose-pieces heretofore designed are open to the objection of want of stability when using objectives with screw collar adjustment; by turning the collar either to the right or left the objective is liable to fall off the stand, but with the nose-piece here designed the ob-



jective is held as secure as with society-screw and can be changed from one power to another in five or ten seconds. To release the objective from stand, turn the collar of attachment which allows the adapter to be taken out. The nose-piece is made either with society screw or Butterfield broad gauge. Price of nose-piece, including two adapters, $5.00; New Congress Safety Nose-Piece, $7.00.

THE ILLINOIS STATE MICROSCOPICAL SOCIETY.

AT a regular meeting of the State Microscopical Society of Illinois, held on November 9th, Dr. F. W. Mercer spoke of the use of the electric light in reference to microscopical illumination. Two forms of lamps were exhibited; one with pointed top and one of globular form, of about 2½ candle power. Either an accumulator or ordinary battery could be used as a source of electricity. The light from these lamps is far superior to that from other sources.

Dr. J. J. M. Angears, of the College of Physicians and Sur-

geons, Chicago, read a paper on "The Detection of Adulterations in Lard," which was in substance as follows: The size and form of crystals depend upon the mother liquor. Stearin and palmitin are of a definite composition, and always of the same form of crystals under the same circumstances; hence it is useless to attempt to detect tallow in lard by isolating them. This *can* be detected by making a *direct* examination of the substance.

His method is to put a portion of the lard on the slide and covering it with a cover-glass; then warming it just enough to spread it —not to melt the stearin—using about 100 diameters and the dark background of the polarizer.

By studying the general pattern of the slide as well as the individual masses of crystals we shall see that one per cent. of tallow mixed with pure lard gives a different combination of crystals from pure lard.

Pure lard, pure lard with one per cent. tallow, pure lard with two per cent. tallow, lard found in the market, tallow and cotton seed oil, and adipose tissue were exhibited.

WILLIAM HOSKINS, Sec'y.

CHRONIC LASSITUDE.—There are certain characteristics connected with a lazy man which are admirable. They excite in the twanging, jingling breasts of the nervously fidgety a feeling which borders on respect and is akin to awe. Your double geared fidgety man will spin all day like a top and run down in the cool of the evening on the identical spot on which he started off after breakfast. The man suffering from chronic lassitude will keep still, keep cool, keep in the shade, put in a full day's work resting himself, and arrive on time at sun down, cool, calm, and collected, without having once sweat under the collar or laid a hair.

The professional lazy men seems to eat, drink, and sleep with as much gusto and *sang froid* as his fidgety brother with the high pressure anatomy and patent double cylinder, fast, perfecting, hygienic apparatus, who gets hot in the box, and wears and grinds and cuts his life away like a piece of misfit machinery. The fact of the business is, the man of bustle wears his life away for the want of the oil of rest. The lazy man just soaks along like a handful of cotton waste in the oil cup of a box car axle.

Correspondence.

JACKSON, Mich., Oct. 31, 1883.

Prof. C. H. Stowell, Ann Arbor, Mich.:

DEAR SIR.—I last evening called the attention of our club to your suggestion in October journal, relative to the formation of a State Society. It seems hardly necessary to add that the suggestion met with the hearty approval of the Jackson Club of Microscopy, and you are at liberty to draw on us for our enthusiastic support in this direction.

I would here add that our club has recently suffered a pretty severe loss in the removal of our President, General Wm. Humphrey, who has transferred his affection, or rather his personal influence, to Adrian. General Humphrey, as is well known, has enjoyed a national reputation as one of the foremost workers in the ranks of scientific investigators especially with the microscope and his contributions in time, money and hard work form a no mean legacy to the cause of science.

While we consider ourselves entitled to the sympathy of neighboring clubs, we also extend our hearty congratulations to the prospective club in Adrian which we feel sure will, under the General's influence and leadership, soon spring into an active and useful entity. However, anything hereinbefore contained in anywise to the contrary notwithstanding, the General has not yet officially severed his connection with the Jackson Club, and we therefore still claim ownership by right of possession.

For the good of the cause the writer would suggest the following method for mounting entomological slides. Treat the object for a week or a month as the case may require with liquor P. until thoroughly bleached, then, without removing the contents of the cavities, or in any way subjecting to the slightest pressure, mount in glycerine in a cell of ample depth so as to allow the object to retain its natural form and position. This method certainly has its advantages and were it not that Mrs. Stowell would almost certainly come forward with slides which she had mounted in the same way five years ago, I would modestly claim the honor of being the first to mount insects by this method.

Yours fraternally, and for the good of the order,

C. H. BENNETT, Secretary.

Jackson Club of Microscopy.

CHICAGO, Ill., Oct. 29, 1883.

Chas. H. Stowell, M. D.:

DEAR SIR.—At the first regular meeting for the season, of the State Microscopical Society of Illinois, Dr. H. A. Johnson was announced to read a paper on "Some organic remains found in the boulder clay underlying Chicago," he being absent however, Mr. Fellows showed some specimens of the organisms found by Dr. Johnson. Dr. H. J. Detmers referring to an article by A. Y. Moore in the June number of the MICROSCOPE, on the resolution of amphipleura pellucida with mirror central "stated that he thought the explanation therein was entirely incorrect, his explanation being as follows: The light from the mirror central passed through the slide, etc., some of the light being totally reflected from the convex surface of the immersion fluid, on to the diatom thereby illuminating it by oblique light from above giving often a dark field illumination and resolving the diatom beautifully. The doctor stated that he had written to Mr. Tolles on the subject and that he, (Mr. Tolles) had said that this theory was correct.

Mr. W. H. Bullock showed a new nose piece which has very superior advantages over other adapters, especially as it will not come off when using collar adjustment.

A resolution was passed offering copies of the lens, complete for $3 per set.

Yours truly,

WM. HOSKINS, Secretary.

Dr. Detmers desired me to state that he would send you for publication a full description of his theory, etc.

Recall at night not only your business transactions, but what you have said of those of whom you have spoken during the day and weigh in the balance of conscience what you have uttered. If you have done full justice in all your remarks, it is well. If you have not, then seek the opportunity to make amends, and carefully avoid a repetition of the wrong.

LIFE IS THE GREAT ANTISEPTIC.—"Life and putrefaction are not correlative, but antagonistic; and in proportion as the surgeon utilizes and economizes the attributes of life, he will find himself independent of these changes which are inherent to decaying organic matter whether it be in bagging wounds or boggy lands. Life is the great antiseptic."

Editorial Department.

IMPORTANT ANNOUNCEMENT—A MONTHLY JOURNAL FOR ONE DOLLAR.

THIS number closes the books for volume three of "The Microscope."

On the fifteenth day of January we shall issue the first number of volume four, as a monthly journal of twenty-four pages.

We shall aim to make our journal the representative of "American Microscopy" in the broadest sense of the term. That part of our old title therefore—"and its relation to medicine, etc.,"—will be omitted.

As the length of our list of subscribers increases so will the number of our pages increase.

We make this change to a monthly at considerable extra outlay of money and labor, but we do it in the belief that the microscopists of our country will be pleased with it. Does it please you? Then encourage us by dropping a line and telling us so.

Our subscribers are entitled to one more number of forty-eight pages to complete this volume, for which they have paid one dollar. We desire all subscriptions to commence with the January number. Therefore, *all old subscribers will please forward to us eighty cents for volume four.* This will pay your subscription for our monthly from January, 1884, to January 1885.

Persons not intending to renew for volume four will receive the January and February numbers, after which their names will be dropped at their request.

Those who have not settled for volume three will please send one dollar and eighty cents for volumes three and four.

A HAPPY NEW YEAR.

THE year eighteen hundred and eighty-three is drawing to a close and in a few days the new year will be welcomed in.

Time passes so rapidly with those who are earnestly engaged in the more active duties of life, that its flight is not appreciated until the death-knell of the old year is sounded and we are suddenly aroused by the merry peals of the new.

The history of the past teaches us we are safe in asserting that not a single reader of this journal has passed through the year without feeling the pain of some sorrow; yet most of us, at the same time, have been blessed with many of the real comforts of life. So while we wish you all a Merry Christmas and a Happy New Year, we add, most emphatically, *make it merry and happy to yourselves and to others by generous gifts to the poor.*

A NEW MICROSCOPICAL JOURNAL.

AT the close of the present year, Mr. S. E. Cassino, of Boston, will discontinue the publication of the *American Monthly Microscopical Journal.*

In the place of that journal he will present the *Science Record*, a monthly journal of scientific notes and news, in which the microscope will occupy the most prominent position.

"All theoretical questions of little practical importance and less popular interest will be omitted." Evidently from this quotation from Mr. Cassino's circular, he has found from experience that it does not pay to publish a microscopical journal that contains nothing but "theoretical questions of little practical importance and less popular interest." We are very glad that Mr. Cassino has taken hold of this matter, for as a publisher he is so situated that he cannot fail to make this a success. J. S. Kingsley, of Malden, Mass., is the new editor and to him we extend fraternal greetings.

'We hate the man who makes his fame,
By tearing down another's name.'

Therefore, Mr. Kingsley, just because you are to edit a microscopical journal you will not be called—by us—all manner of unkind and evil things as a certain editor (who has just returned from England!!) choosed to call us when we were young and inexperienced with the editorial pen.

However, we could wish you no better success than to get the free advertising we were given at that time. It brought us scores of subscribers, eighty-five in one month. "For," said a friend in a letter to us, "if Mr. ——— is against you, it is the best evidence in the world that everybody else is for you."

The subscription price to "*Science Record*" is one dollar a year. Any of our subscribers wishing that journal may remit to us and we will forward the amount to the proper parties.

ONE of those elegant mounts that occasionally feast the eyes of the microscopist comes to us from Frank Ritchie, Troy, N. Y. It is a specimen of the *Psephenus Lecontei*. "The chief interest of this beetle," says Prof. Kellicott, "centers in its larva which is aquatic, flat and so closely resembles the extinct trilobites that DeKay first described it as a new *gen. et spec.* of the crustacea."

MILTON BRADLEY & CO., of Springfield, Mass., are selling cabinets containing four or five hundred specimens for only three or four dollars. They also make cases for holding one, two, or more slides, to serve as protection for slides to be sent through the mail. These cases will retail for about a cent each, or even less when several are ordered. The firm will give further particulars.

PERSONS are hereby cautioned against negotiating for a Tolles' $\frac{1}{10}$th of 180°, made in 1878. The same has been stolen from a subscriber and any person hearing of such a glass being offered for sale will please communicate the fact to us at once.

THE price of the *Journal of the Postal Microscopical Society of England*, Alfred Allen, editor, is two dollars a year. It is issued quarterly.

The price of *The Journal of the Royal Microscopical Society*, Frank Crisp, editor, is seven dollars a year. It is a bi-monthly of 125 pages. We will forward subscriptions for either of the above.

PLEASE renew for volume four, commencing as a monthly the middle of January next, by sending us eighty cents at once. All old subscribers, however, are entitled to the January and February numbers.

The regular price for the twelve numbers of volume four will be one dollar.

WE have only a very few sets of volume one of this journal. The price from this date will be $2.00. The price of volume two will be $1.50, and the price of the five numbers of volume three will be $1.00.

OUR genial and ever-good-natured friend, Mr. Romeyn Hitchcock, is suffering from another attack of his chronic disease, but this time it is directed toward his old publishers, Messrs. S. E. Cassino & Co., circulars concerning which have been freely distributed.

Selections.

On Fixing the Aniline Dyes.—The *British Medical Journal* for March 10 contains an article by Mr. H. A. Reeves, F. R. C. S. E., on fixing the aniline dyes in microscopical staining; and though in the article mention is only made of anatomical and pathological preparations, we think it likely that the method described will be found capable of a much wider application. Mr. Reeves states, that for the last eighteen months he has been systematically experimenting with a vast number of chemicals, singly, and combined in various proportions, with a view to finding a suitable mordant, and the result has satisfied him that the dyes may be fixed by placing the stained sections first, for from three to five minutes in a mixture of equal parts of a saturated aqueous solution of tannin, to which a little carbolic acid has been added, and distilled water. Then wash in water, and transfer for the same length of time to a mixture of tartar emetic and water, a few drops of a saturated solution of tartar emetic being added to a watch-glass full of water. The sections should then be again washed; placed for five or ten minutes in strong methylated spirit, drained of superfluous spirit, and mounted in Canada balsam or dammar, after having been passed through oil of cajuput, cloves, juniper, aniseed, or turpentine. The tannin and antimony solutions should be filtered into the watch-glass before using, as also the dyes. Preparations hardened in Müller's fluid or spirit answer best, but chromic acid hardened specimens can be used, if, previously to staining, they be soaked for twenty or thirty minutes in methylated spirit.

Other agents will partially or completely fix some of the anilines; such as arsenious, acetic, hydrochloric and carbolic acids, hypophosphite of soda, tannate of soda, and silicate of soda, to which a little hydrochloric acid has been added, and these should be tried in special cases. A saturated aqueous solution of acetate of potash fixes roseine, saffranine, and soluble blue, and partly fixes fuchsin.

Mr. Reeves also draws attention to two or three new or little-known dyes, which he thinks might be used with advantage in microscopy. The new dyes are phloxine and erythrosine. They stain rapidly and deeply in weak aqueous solutions, and stand spirit well. Connective substances and the protoplasm of cells are, in rapid staining, preferred by them to the nuclei, which, however, stand out

on the stained ground very clearly. Phloxine is the more beautiful and pleasant color to work with. Both are soluble in water or spirit, and weak solutions stain quickly. If sections are placed in weak solutions for several hours, the nuclei often take on the stain. Both these anilines are darkish red powders by reflected light, phloxine having a faint purple-crimson color, and the color of the solutions in a test tube will vary with the strength. Murexide is a brownish-red powder, very slightly soluble in cold water, not soluble in spirit, but readily so in boiling water. On cooling and filtering, sections are immersed for five or ten minutes, when it will be found to give a good ground-stain for double-dyeing. With acetate of zinc it gives a yellow stain.

Maroon, phosphine, cerise and mauve are all useful and unused colors, phosphine yielding a good ground-stain of a rich golden yellow, available with advantage for double-staining. The rest resemble most of the other anilines in picking out the nuclei, but they also stain the other structures. Dilute aqueous or alcoholic solutions stain rapidly, and may be fixed by the process described above, though phosphine holds very well of itself.

Induline, which is also a new aniline color, is a dark powder, giving a pale bluish-purple stain. If used after carmine or picro-carmine, the cell-body and intercellular substance will be preferred by the induline, and the nuclei and connective fibres by the other colors. It dissolves in warm water or dilute alcohol. Maroon, phosphine and cerise are new to histology.—*Journal of the Postal Microscopical Society.*

Preparing Insects and Spiders.—Mr. S. Green formerly found great difficulty in arranging insects and spiders in proper position. Legs would double up and wings would not remain expanded. It is only very recently that he has overcome the difficulty, and as the method may also be novel to other amateur mounters, he describes it in full.

"On capturing an insect, consign it at once to the poison bottle if convenient, and there let it remain until it is quite dead. Do not let it lie in the bottle for longer than half an hour. Ten minutes is generally sufficient. The action of the cyanide of potash would in a few hours injure materially the muscular structure of the insect, and spoil it as a microscopical object. You should remove the insect

before its legs and wings become rigid; but first have ready a small piece of glass, on the surface of which spread a thin film of rather stiff Canada balsam. Then place the fly, or any other insect you may be operating on, lightly upon the Canada balsam film in the position you desire. If a dorsal view is required, and a winged insect the subject, place it back upwards, then with a fine needle or pin arrange its legs and wings. The legs may be made to adhere their entire length to the balsam, but it is desirable that only the tips of the wings be held down by the balsam. In this position the insect should remain for two or three hours to allow the balsam to become harder and the limbs of the insect stiffer. Then place the piece of glass with the insect adhering to it in spirits of wine, where it should be allowed to remain for two or three days. It is not unlikely that in the course of a few hours the action of the spirits may cause the film of balsam to become detached from the glass. This will not matter, for the hardened film will be found sufficiently dense and strong to keep the legs and wings of the insect in the position they were originally placed in by the setting needle. Should, however, the film not become detached when it is time to withdraw the piece of glass from the spirits, it is easy to remove the insect by placing the piece of glass in spirits of turpentine, which will dissolve the hardened balsam. If, as mentioned before, the film has become detached from the glass, a few hours after its first immersion in the spirits, it should remain undisturbed in the spirits for some days, and then it can be treated with turpentine. It should be kept in clear spirits of turpentine until it has become sufficiently transparent for mounting in Canada balsam.

There are some species of spiders that will crumple up their legs unless pinned out. The pinning out is not at all a difficult process; it merely takes a little more time. Fasten with fine tin wire a thin cutting of cork to a piece of glass, then spread a thin film of Canada balsam on the cork. Lay the spider in position on the balsam, and having previously cut the points of a number of fine pins, take the points up with a pair of light forceps and stick them into the cork against the inner side of the legs of the spider. One point, if properly placed, will be sufficient for each leg. The palpi and mandibles may also be kept in position in the same way. After this has been accomplished put the whole in spirits of wine and follow out the treatment described for flies. The piece of glass must,

of course, be sufficiently heavy to sink the cork in the spirits. Care should be taken in withdrawing the pin-points when the spider is ready for transfer to spirits of turpentine. The hardened balsam must first be dissolved, then the pin-points taken out and the spider carefully removed from the cork. When quite clean place it on another piece of cork or glass, and pin out as before and put it into the turpentine bath, where it should remain until it is fit for mounting in balsam. The pins should be about one-quarter of an inch long and tolerably fine. In setting ants on the film of Canada balsam their jaws will not always remain open. To prevent their closing a small splinter of wood may be placed between the points of them, which, if carefully done, keeps them well open. The precaution is not necessary while they are in the turpentine bath.

If it is desirable to keep insects for any length of time before mounting them in Canada balsam, or if they have to be sent to a distance by post, the preparation of them should be stopped after they have been in spirits of wine on the film of Canada balsam. The film, with the insect on it, can be detached from the piece of glass by cutting the former with the point of a fine needle drawn round the insect. Remove the detached piece of film and place it in a small glass bottle full of clean spirits of wine. The hardened balsam can at any time be dissolved away from the insects by spirits of turpentine. It is sometimes easier to set small insects in position by placing them on their backs upon the film of balsam. Their legs can be arranged in that position with greater facility.—*Royal Mic. Journal.*

MICROBOMANIA AND MICROPHOBIA.—The symptoms and effects of these two maladies are wittily described by M. Paul Somans in the feuilleton of a recent issue of the *Gazette Medicale de Paris.*

In connection with the numerous maladies, or rather symptoms, which have recently been described, such as agarophobia, claustrophobia, morphiomania, etc., there is a new mental disease, which is making great ravages among our medical brethren. I speak of microbomania and its indispensable corollary, microphobia.

Microbomania is an affection of adult or middle age, sometimes attacking those in advanced years. It is most frequently observed among the best educated physicians, those most given to biological research, and almost always ambitious.

It is characterized at the début by a great desire to be spoken of in the scientific world, accompanied by a slight degree of fever and a strong resolution to discover by the aid of the microscope certain mobile corpuscles in the blood or other liquids of patients suffering from the most diverse maladies.

The desire is soon followed by acts calculated to satisfy the special craving.

In the end the presence of corpuscles is averred in impaludism, measles, scarlatina, even in mumps, and the minute organisms are charged with all the crimes imputable to each pathological individuality.

But if, perchance, several individuals under the influence of this form of mania should concentrate their attention on one and the same disease, they are very apt to describe widely differing microbes.

But this mischance affects them very little, the noise raised by their discovery, and the discussion it provokes, brings their names before the scientific world, and that generally suffices for the cure of the disease; but relapses are frequent. Microphobia is more frequently observed than the other, and its ravages increase in proportion to the discoveries made by the microbomaniacs. The married physician, with the constant fear of microbes before his eyes, dreads the approach of his children until he has removed his outer clothing and made antiseptic ablutions. But happily carbolic acid has penetrated to the most distant climes, and enables the microphobic physician to return to his family circle.—*Philadelphia Med. and Surg. Reporter.*

Who Would not be a Doctor?—Quite a number of our young men are studying for the medical profession. We do not wish to deter them from this laudable pursuit, for a physician's calling is one of the most honorable, ennobling, humanizing, and useful in the world. But all is not gold that glitters, and the following are some of the sweets of a doctor's life: If he visits a few of his patients when they are well, it is to get his dinner; and if he does not do so, it is because he cares more for the fleece than the flock. If he goes to a synagogue regularly, it is because he has nothing else to do; if he doesn't go, it is because he has no respect for the Sabbath nor religion. If he speaks reverently of Judaism, he is a hypocrite; if

he doesn't, he is a materialist. If he dresses neatly he is proud; if he does not, he is wanting in self-respect. If his wife does not visit you, she is "stuck up;" if she does, she is fishing for patients for her husband. If he has a good turnout, he is extravagant; if he uses a poor one on the score of economy, he is deficient in necessary pride. If he does not write a prescription for every trifling ailment, he is careless; if he does, "he deluges one with medicine." If he makes parties, it is to soft-soap the people to get their money; if he does not make them he is afraid of a *cent.* If his horse is fat it is because he has nothing to do; if he is lean, it is because he isn't taken care of. If he drive fast, it is to make people believe somebody is very sick; if he drives slowly, he has no interest in the welfare of his patients. If the patient recovers, it is owing to the good nursing he received; if he dies, "the doctor did not understand his sickness." If he talks much, "we don't like a doctor to tell everything he knows," or, "he is altogether too familiar;" if he don't talk, "*we like to see a doctor sociable.*" If he says anything about politics "he had better let it alone;" if he don't say anything about it, "we like to see a man show his colors." If he does not come immediately when sent for, "he takes things too easy;" if he sends in his bill, "he is in a terrible hurry for his money." If he visits his patients every day, it is to run up a bill; if he don't, it is unjustifiable negligence. If he orders the same medicine, it does no good; if he changes the prescription, he is in league with the druggist. If he uses any of the popular remedies of the day, it is to cater to the whims and prejudice of the people, to fill his pockets; if he don't use them, it is from professional selfishness. If he is in the habit of having frequent consultations, it is because he knows nothing; if he objects to having them on the ground that he understands his own business, "he is afraid of exposing his ignorance to his superiors." *If he gets pay for one-half his services* he deserves to be canonized. Who wouldn't be an M. D.?—*The Hebrew Standard.*

McCalla's Nose-Piece.—Prof. A. McCalla refers to a form of nose-piece which he considers to have some advantages over Pease's "Facility" nose-piece and that of Nelson. "It is simply a form of bayonet catch which would dispense entirely with the screw, and hold the objective perfectly secure against sagging on one side or working loose when the adjustment collar was in use."

Items.

A good-sized glass fish-eye, mounted in a piece of cork makes a very satisfactory spot-lens indeed.

An English writer desires "something after the style of the Postal Microscopical Society, but with less routine, which might be put briefly thus:—No fees, no secretary, no journal, no annual meeting," and he might wisely add "no nothing."

There was exhibited at the Dublin Microscopical Club, some sections perpendicular to long axis of hairs. Stained with picro-carmine and anilin violet, which latter tinges the outer (Henle's) layer of the inner root-sheath. Huxley's layer staining with picro-carmine as well as the outer root-sheath, the various layers of the complex wall of the hair-follicles were extremely well differentiated.

A writer in *Nature* has advised a method for freeing objects from air preparatory to mounting in glycerin jelly, etc.. which was used by us years ago to free the stalks of zoophytes, polyzoa and other specimens from air, and which, we believe, has been already published in this journal. The sections are simply placed in thoroughly boiled water. Boiling expels the air dissolved in the water, and by placing the sections in such water the air is more or less taken up by the water. The process is rather a long one when any considerable quantity of air has to be removed.

C. L. P. asks how to lacquer polished brass at home? If it can be heated on a common oven, and about how hot? What to apply and how to apply it and how to prepare it? How hot the article should be, and how long it should be left before using after lacquering? A. The brass must be perfectly clean; it must be boiled in caustic lye if necessary. Many lacquers are used; half a pound of red lac dissolved in half a pint of alcohol is a good one. Put the article on the top of a stove until moderately heated and then varnish it, keeping it hot. Then dry it by heat.

Inulin in the Artichoke.—Pistone and de Regibus find in the bracts of the artichoke, *Cynara Scolymus*, a substance identical with the spherocrystals of inulin of Sachs, turning the plane of polarization to the left, even in the presence of a dilute acid, and not colored by iodine.

A Substitute for a Revolving Table.—Board set on rollers and carrying the microscope and lamp round a house table by revolving on a centre through the medium of an arm on stalk. As a screw put into a mahogany table would be objectionable, a centre is made of two disks of wood between which the stalk revolves freely on a screw, a 10 lb. weight on the uppermost disk preventing the centre from slipping about the table.

The Microscopic Examination of Water.—The *Rep. Anal. Chemie.* states that J. Brautlecht produces a precipitate in the water by adding to one hundred c. c. five drops of a solution consisting of one part aluminum sulphate, one part hydrochloric acid, and eight parts water, followed up by one to three drops of liquid ammonia. The precipitate settles readily, and after decanting off the clear liquid, is collected upon a smooth filter, stroked off with a glass rod, and thus transferred to a test tube, in which it is dissolved in ten to fifteen drops of dilute acetic acid. The clear solution is examined with the microscope, at first alone, and then after the addition of a solution of saffranine. By adding ½ per cent. of gelatin, permanent preparations may be obtained on Koch's principle.

The Mutability of Bacteria.—The question whether the same germs under different conditions give rise to various diseases has been raised, but not settled. Dr. Carpenter, at the meeting of the British Association, treated the subject from a point of view of natural history. He referred to the facility which the lower forms of life possess of adapting themselves to changed conditions of existence. He believes that the same germs may, under altered circumstances, produce various diseases, and these opinions he supported by various arguments. The decrease of the virulence of the small-pox which ravaged Europe in the fifteenth century he attributed to the cultivation of the mildest cases which occurred. A severe attack of any particular disease may so affect the system that a disease arises which cannot be recognized as related to that from which it proceeded. Under favorable conditions an ordinary intermittent fever may develop into a virulent form, which is highly contagious. There is, in his opinion, very strong ground for the belief that even the innocent hay bacillus may undergo such an alteration in its type as to become the germ of severe disease.

Freeing Objects from Air.—A writer, whose name is not given, describes the following very simple but efficient process for freeing objects from air before mounting in glycerine jelly, depending on the great solubility of air in water: A wide-mouthed bottle, of about four ounces capacity, with a closely fitting solid stopper, is completely filled with water, which at the time is, and for half an hour previously has been, boiling in order to expel all traces of dissolved air. The stopper being then inserted without inclosing a single air-bubble, the bottle is set aside until cool enough to receive the sections which are then to be put into it. A few drops of boiling water are then to be added to make good the inevitable loss in removing the stopper; the bottle is to be again closed, wiped dry, and securely sealed with melted paraffin. After twelve hours it may be opened, and the whole contents turned into a white porcelain shallow dish. The sections can then be easily seen, and picked out with a section-lifter, and should be soaked for half an hour in a 50 per cent. solution of glycerine before mounting.

Microscopists at Dinner.—When the microscopists sat down to dinner, each one produced his compound oscillating microscope, and carefully examined every article of food. Excited shouts went as new discoveries of metallic, vegetable, and sausage substances were discovered in the soup. An examination of the water resulted in the discovery of such an enormous quantity of infusoria, mammalia, and pachydermata that the microscopists unanimously refused to drink it. During the progress of the meal, much enthusiasm was aroused by the announcement of Professor White that he had discovered a trace of hairpin in the beefsteak, thus upsetting the theory that the beefsteak of American hotels is a chemically pure carburet of sole-leather; and at a later hour, Professor Black's assertion—based on a thorough microscopical examination—that he had discovered whortleberries in the whortleberry pudding, and wine in the wine-sauce, led to a heated discussion, in the course of which 38 microscopists declared that Professor Black was an ignorant and unprincipled pretender, and 11 others maintained that the Professor was acting in good faith, and that his discoveries could be accounted for on the theory that the waiter had given him, by mistake, a piece of wortleberry pudding made expressly for the landlord's private table.

Reviews.

A Text-Book of Botany. By Julius Sachs, Professor of Botany in the University of Würzburg. With an Appendix by Sidney H. Vines, M. A., D. Sc., F. L. S. Fellow and Lecturer of Christ's College, Cambridge. Second edition. Pp. 980. 492 figures. MacMillan & Co., 112 Fourth Avenue, New York. 1883.

A new edition of this standard work will be warmly welcomed by American botanists, for there is no other book its equal in its own field. In fact, as a text-book of botany it stands prëeminently ahead, no other work even approaching it in its completeness.

The first few pages have been entirely rewritten, and, that Book I. might be more complete, an appendix has been added of twenty pages. This appendix forms a valuable addition to the work. The index covers eighteen three-columned pages, thus enabling the reader to refer to any subject quickly and accurately.

The illustrations have ever been a prominent feature of the work. Nearly every one is original and the direct result of laborious investigation. The engraving is done in the highest style of the art. Before us then is a full, complete text-book of botany. It is so complete, so superior, that words of faint praise detract from rather than add to its true worth. To the botanist it is indispensable, and to the microscopist supremely valuable.

A Manual of Chemical Analysis, as Applied to the Examination of Medicinal Chemicals. Third edition. Thoroughly revised and enlarged. By Frederick Hoffmann, A. M., Ph. D., Public Analyst to the State of New York; and Frederick B. Power, Ph. D., Professor of Analytical Chemistry in the Philadelphia College of Pharmacy. Henry C. Lea's Son & Co. Philadelphia. 1883. Pp. 624. Figures 180.

This work has been before the professions of medicine and pharmacy so long that its true value and place can be easily ascertained. It is certainly a safe guide for the detection of impurities and adulterations. The identity and quality of medicines and of the substances used in their preparation are carefully considered.

The illustrations of various crystals are very beautiful and, so far as we have examined, very accurate.

The present edition contains much new and original matter, until now the work contains all the most approved methods for the separation, identification and quantitative estimation of those chemical poisons likely to be met with in forensic medicine. It is a guide to the quality and purity of the medical chemicals of commerce.

INSECTS INJURIOUS TO FRUITS. By William Saunders, F. R. S. C., etc. Pp. 436. Figures 440. J. B. Lippincott & Co., Philadelphia. 1883.

The author commences with a description of those insects injurious to the apple, the pear, the plum, the peach; and, devoting a chapter to each fruit, concludes with the olive and the fig. We have noticed over twenty fruits described with their own particular insects. Take for instance chapter I, on The Apple. The author describes first those insects that attack the trunk, then follows in order those that attack the branches, the leaves and the fruit. This classification will greatly facilitate the determination of any injurious species.

The remedies that have been the most successful in subduing each individual species are fully discussed and described, enabling the reader to decide at once as to the best methods to be employed.

The work is interesting to students of entomology, and invaluable to all fruit-growers, whether or not they have many or few acres. Any person who may own a few vines or trees will find this a handy book to have about at the right time.

NEW TEXT-BOOK OF GEOLOGY. By James G. Dana, LL. D., author of "A Manual of Geology," etc. Fourth edition, revised and enlarged. Pp. 412. 450 figures. Ivison, Blakeman, Taylor & Co., New York and Chicago. 1883.

This text-book is after the general plan of Professor Dana's "Manual," and is certainly an American book. The illustrations are largely from American facts, as the geysers of the Yellowstone, the Mammoth Cave of Kentucky and the canons of the Colorado.

This edition has about fifty pages more than the preceding one, thus allowing of fuller and more complete accounts.

The kinds of life which contribute to rock-making, the geographical distribution of marine species and the depths of the seas are some of the topics discussed in this edition for the first time. It does not take the place of Professor Dana's large manual, yet it is evident from the number of editions sold that it is one of the best text-books of its kind for schools and academies.

CHARGES, RESPONSES AND EVIDENCE SUBMITTED, in the case of McGeoch, Everingham & Co. vs. Fowler Brothers. Chicago. August, 1883.

Through the courtesy of B. W. Thomas, of Chicago, we have been supplied with a copy of the above publication of nearly three hundred pages. It is of especial interest to microscopists because for the first time in this country, so far as we know, professional

microscopists were employed to testify concerning the detection of adulterations in lard.

Ten or twelve illustrations show the appearances of the pure and adulterated specimens of lard.

Some of this testimony was so very weak that one blushes in thinking of it, while the testimony offered by others will be valuable for all future workers, for some time to come at least. Professor Belfield's testimony on the whole appears to us the best.

TWENTY POEMS FROM HENRY WADSWORTH LONGFELLOW. Illustrated from Paintings by his son, ERNEST W. LONGFELLOW. 8vo, cloth, full gilt, $4.00; morocco, $9.00; tree calf extra, panel side, with polished bevel edge, $9.00. Houghton, Mifflin & Co., Boston.

These poems are illustrated with fifty designs, in which Mr Ernest Longfellow interprets their spirit with rare grace and beauty. A fine new portrait of Mr. Longfellow is prefixed to the volume, and peculiar interest attaches to the book from the fact that the portrait and all the illustrations are from the hand of the poet's son. It is one of the choicest holiday gift-books we have seen. Make it a Merry Christmas to some one by a gift of this beautifully illustrated and elegantly bound work.

DIO LEWIS'S MONTHLY.

A large, illustrated monthly of 128 pages for $2.50 a year. Published by Frank Seaman, 71 Bible House, New York. The editor is represented in the November number as the author of a large number of its articles, one of the best of which is that on "Our Brains and Nerves." As might be expected, it is a bright, sunny journal, filled with readable, entertaining matter, and all of it bound to make men and women healthier and happier.

THE CENTURY MAGAZINE. Union Square, New York.

The serial story entitled "The Bread-Winners," begun in the August number, is approaching its completion, and the reader becomes more and more anxious, as he progresses, to know the fate of the hero and heroines. "Doctor Sevier," commenced in the November number, promises to satisfy even the medical readers of this magazine. "*The Century*" holds the first place among the monthlies. Each number is filled with fresh and instructive reading matter. Our professional friends should certainly follow the typical "Doctor Sevier."

LIFE IN NATURE. By James Hinton. No. 48 of the "Library of Science." Price 15 cents, post free. J. Fitzgerald, Publisher, 20 Lafayette Place, New York.

A most original, acute, well-expressed and altogether remarkable book, distinguished not more by its originality than by earnestness and eloquence. The author is at once a sincere believer and a bold and profound thinker.

THE SUN: its Constitution; its Phenomena; its Condition. By Nathan T. Carr, LL. D. J. Fitzgerald, Publisher, 20 Lafayette Place, New York. Price, post free, 15 cents.

The chief results of Solar Research are ably presented and popularly explained in this little work. The author offers an original and consistent theory of Solar Physics, which appears to reconcile many of the conflicting theories and observations of astronomers.

A PHYSICIAN'S SERMON TO YOUNG MEN. By William Pratt, A. M., M. D. M. L. Holbrook & Co., New York.

This is a 12mo. pamphlet of 48 pages, the contents of which first appeared in "Knowledge."

It contains those physical lessons to young men that will enable them, if obeyed, to grow up vigorous in limb and strong in will. Do not be afraid to let your young men read thoughtfully and earnestly such wholesome sermons as are given here.

ESSAYS BY CHARLES LAMB. John B. Alden, publisher, box 1227, New York City. The Irving Library.

WOMAN AS A PHYSICIAN. By Eugene F. Cordell, M. D. Reprint from Maryland Medical Journal for October, 1883.

The above is an abstract of an introductory lecture delivered before the class of the Woman's Medical College of Baltimore, October 1st, 1883.

The doctor draws many illustrious examples from history—more than we thought possible—to prove that women were eminently successful in the profession of medicine. The great revolution that has been going on concerning this subject is ascribed to the indomitable pluck and perseverance of woman herself.

NEW JERSEY PHARMACEUTICAL ASSOCIATION. 1883. Compliments of A. P. Brown, of Camden, N. J.

THE CORRESPONDENCE UNIVERSITY. November, 1883. Compliments of Prof. G. B. Wilder, Ithaca, N. Y.

AT THE DOCTOR'S EXPENSE.

Latin is a "dead language," especially when an inexperienced drug clerk fools with it.

It is claimed by some medical men that tobacco weakens the eyesight. May be it does but just see how it strengthens the breath.

Says Jobling, in Martin Chuzzlewit: "We know a few secrets of nature in our profession. Of course we do. We study for that; we pass the Hall and the College for that; and we take our station in society by that."

"I understood you to say that your charges would be light," complained a patient when his doctor handed him a tremendous bill. "I believe I said my fees would be nominal," was the reply; "but——" "Oh, I see," interrupted the patient, "*phe*-nomenal!"

A correspondent writing from Hot Springs, Ark., says that the Springs are run by the devil and that he heals his own, so that those who come and receive no benefit can feel assured of their future welfare.

Dr. Holmes relates the following to illustrate the significance of small things, in the sick room: "Will you have an orange or a fig?" said Dr. James Jackson to a fine little boy now growing up to goodly stature. "A fig," answered Master Theodore, with alacrity. "No fever there," said the good doctor, "or he would certainly have said an orange."

At Croton, New York, common drugs are sold at all the stores. Recently, an Irishwoman entered one of them, and said to a new clerk: "Would you be afther putting up for me a pound of Queen Anne's powders?" The clerk took down a package of Royal baking powder, and was doing it up, when she exclaimed: "Not that at all; me Pathrick is sick wid the African fever." "The what fever!" inquired the clerk. "The nigger fever," replied the woman. "And ye should see poor Pathrick shake. He hasn't a tooth left." The woman got the *quinine* which she wanted.

OUR ADVERTISERS.

We wish it distinctly understood that we never use our influence for any particular dealer in microscopes who advertises in this journal. Yet we stand ready at all times to give advice to any subscriber who may wish to purchase goods. The plan they must invariably follow is this: Send to the various firms advertised in our pages for circulars of the goods you wish. Peruse these circulars carefully, and make up your mind of what firm you intend to purchase, then we will step in and assist you in any way. In no case will we decide the house for you. Our answer will invariably be that each house represented with us is responsible and will carry out all they agree to do. So please cease writing such foolish questions: "Which house is the best?" "Are they all honest?"

Bausch & Lomb have just completed a new pattern for their investigator, called "THE INVESTIGATOR IMPROVED." The course adjustment of the "improved" moves nearly two inches higher. The pillar is heavier and higher and has separable swinging substage and mirror bars, each graduated. They have just completed a new ¼ objective of 75° with an extra large working distance. It easily resolves the p. angulatum by central light and yet has an unusually large working distance. It will have a large sale for purposes of urinalysis.

We did not mean any injustice to the house of R. and J. Beck, when we mentioned some months ago that we regretted the slight advance they had made in the price of some of their goods. The advance was not general but applied only to a few special stands. Their "Scholar's" microscope at $25.00 must be sold without profit certainly. Dr. Donelson, of Muskegon, Mich., has just supplied himself with one of their "*New National Improved*," complete. He is delighted with it. The "Ideal" is as popular as ever with working microscopists.

CHAS. FASOLDT, of Albany, recently sent us a micrometer which showed the so-called "rings of Newton" in a beautiful manner. He mailed at the same time a newly ruled micrometer, each alternate line being ruled longer, so that the end of each band is half the value of the band proper; that is, if the band was in the field ruled 50,000 to the inch, then the end of that band would show 25,000 to the inch. Therefore, as Mr. Fasoldt says, "one can easily judge if there is any diffraction."

We have just received from THE PRANG EDUCATIONAL COMPANY, one of the camera lucidas of Oberhauser, which they offer for $16. The ease with which this camera can be used, together with the perfect image that it gives, make it a very desirable accessory. So far as we know it is the only house in this country that deals with the justly celebrated microscopes and objectives of Hartnack. By the way, Harvard College men use no other make.

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EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

FOR SALE.—Ross Binocular Microscope, 6 objectives and full accessories, cost originally, $650. Address, J. G. Langguth, 135 Wabash Ave., Chicago. Also a large "Beck Binocular, $600 outfit," cheap.

I HAVE quite a collection of histological mounts which I should like to exchange for other good slides. E. M. WATERBURY, M. D., Saratoga Springs, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

A HOMOGENEOUS immersion (works also dry, water or glycerin) 1-15, 180° adjustable, to exchange for a higher power. A. Y. MOORE, 57 Prospect st., Cleveland, Ohio.

FOR SALE OR EXCHANGE for objectives or accessories, one copy Carpenter's "The Microscope and its Revelations," also Dana's "Manual of Geology." Both books are new and latest editions. Cost $10.50. H. F. WEGENER, Denver, Colorado.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

WILL EXCHANGE a June or December, 1881, number of this journal for a February number, 1881, or will pay cash for same. D. M. COOL, Faribault, Minn.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

FOR SALE.—One Tolles' 4-10 objective of 100° adjustable; also one 1½ inch objective of 23° by William Wales. Both made to order and first-class. A. L. WOODWARD, Syracuse, New York.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

I WILL exchange good, histological for other first class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

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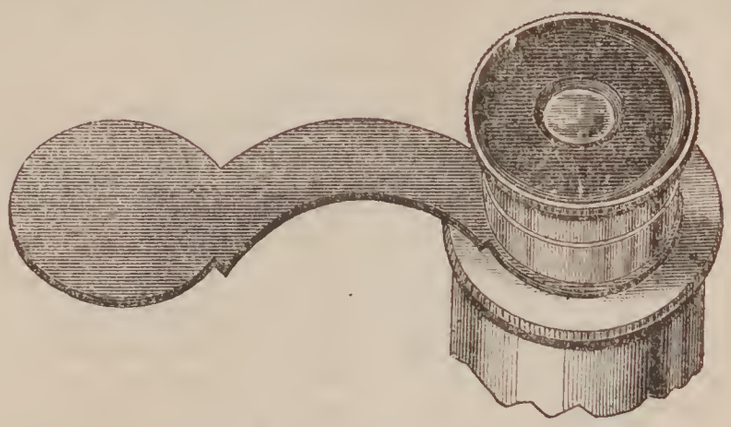

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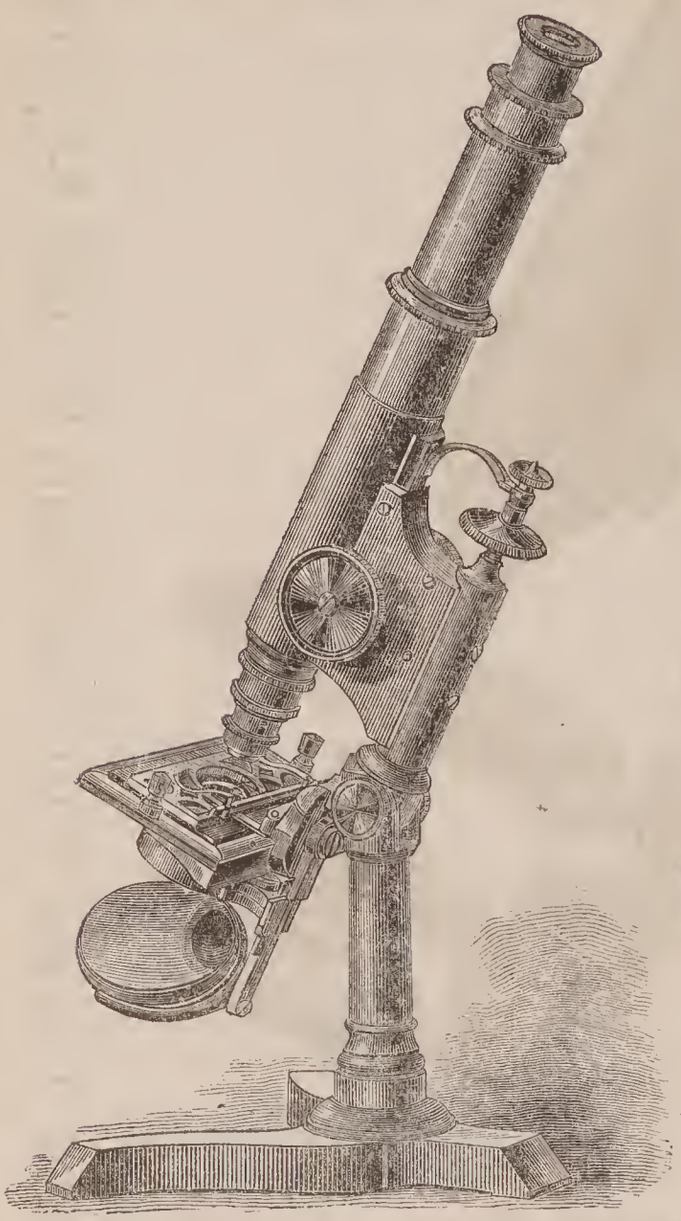

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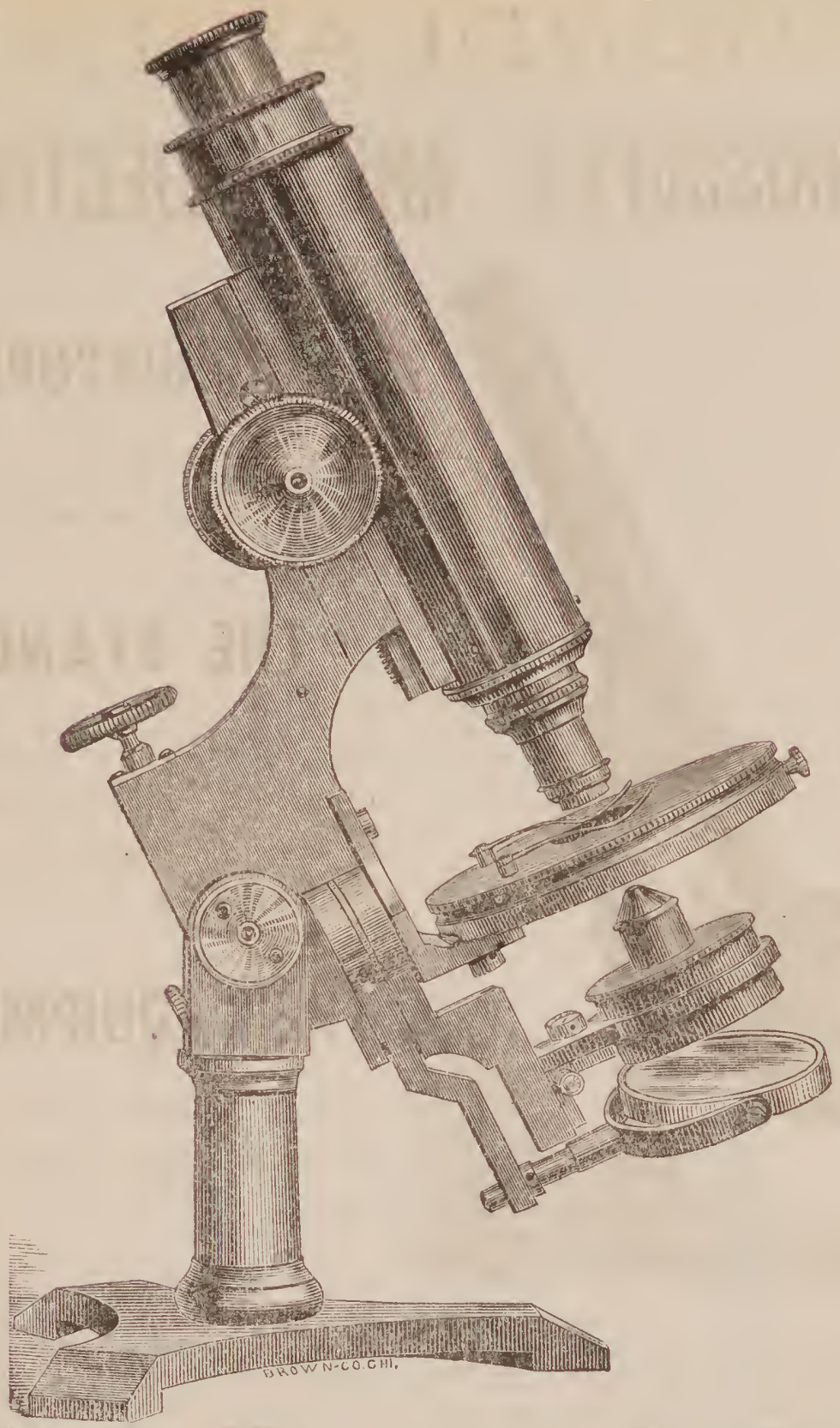

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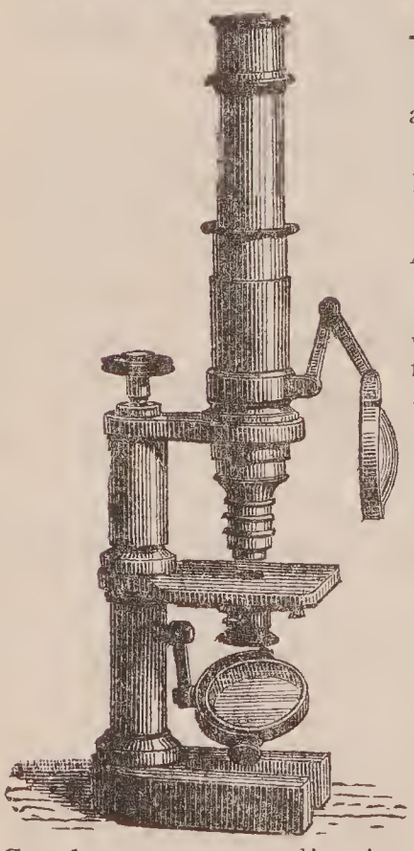

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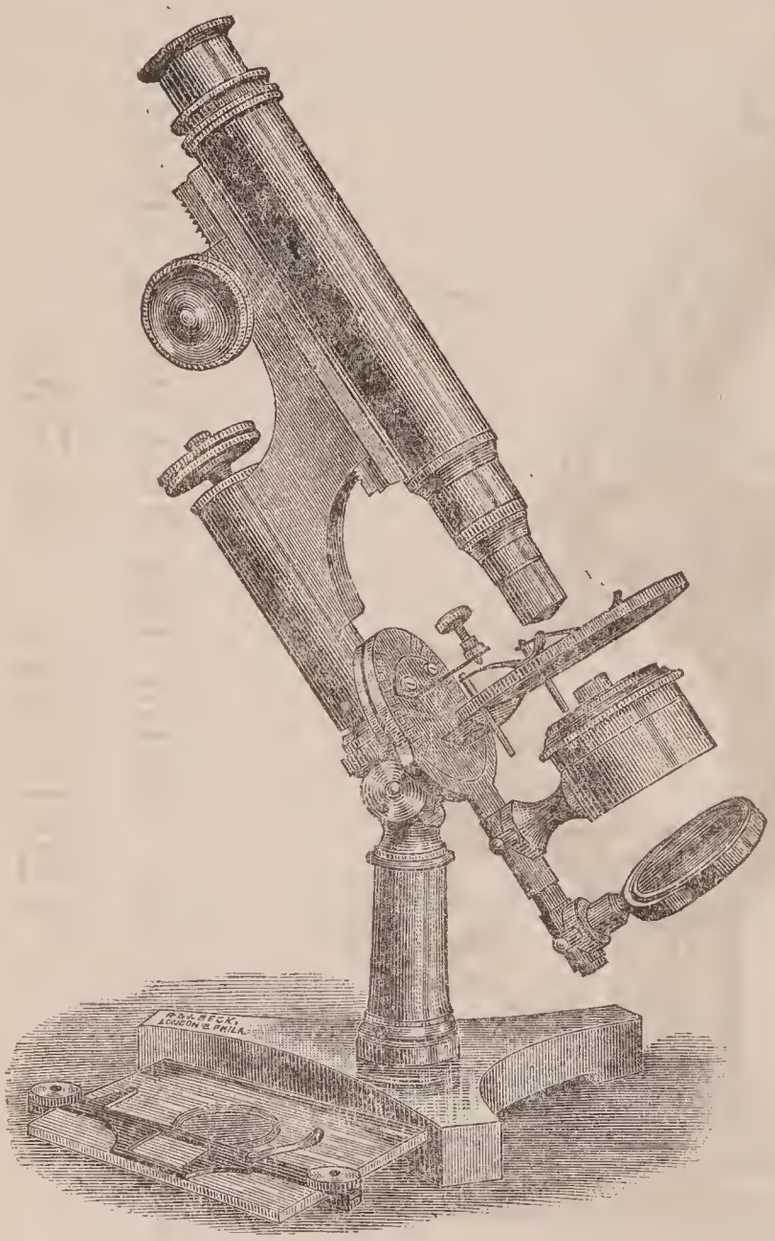

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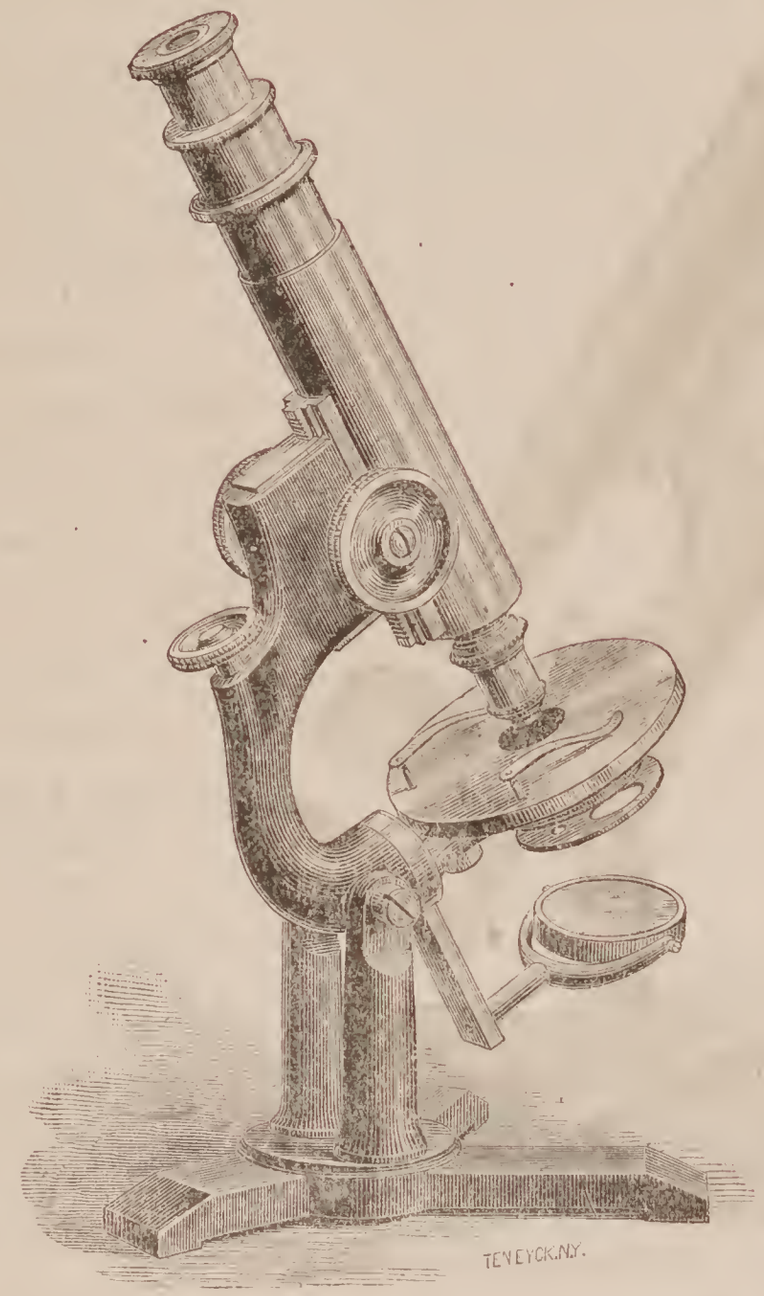

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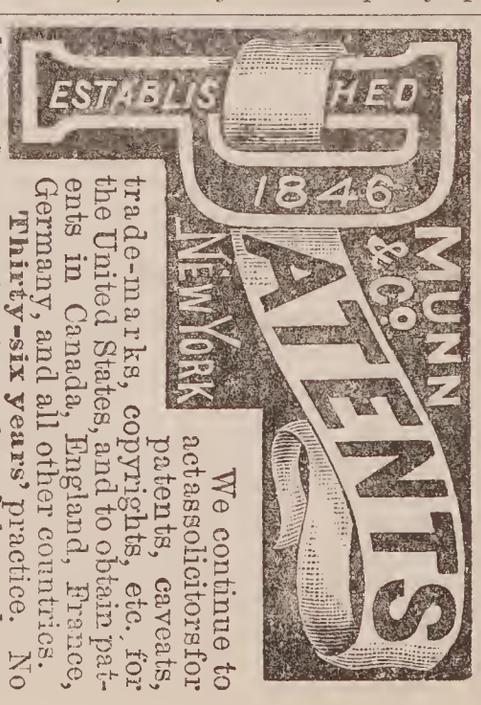

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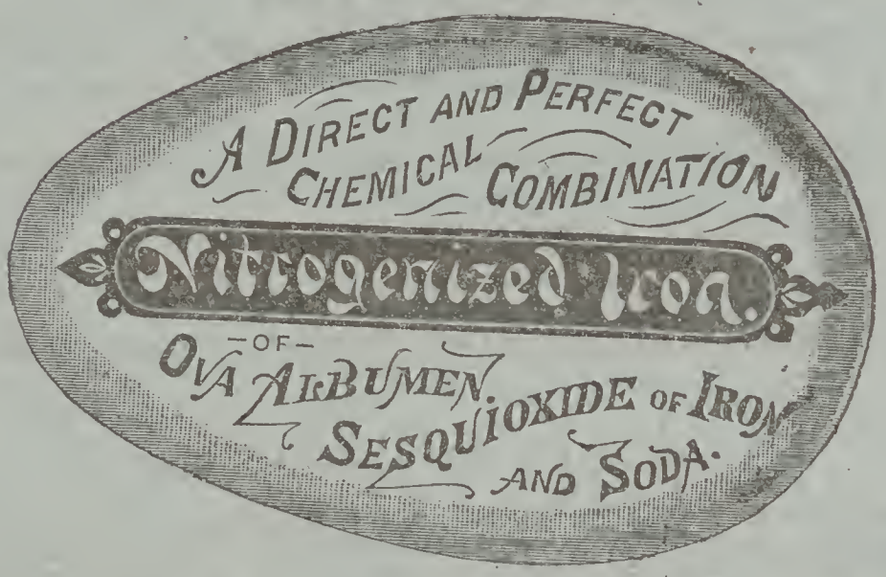

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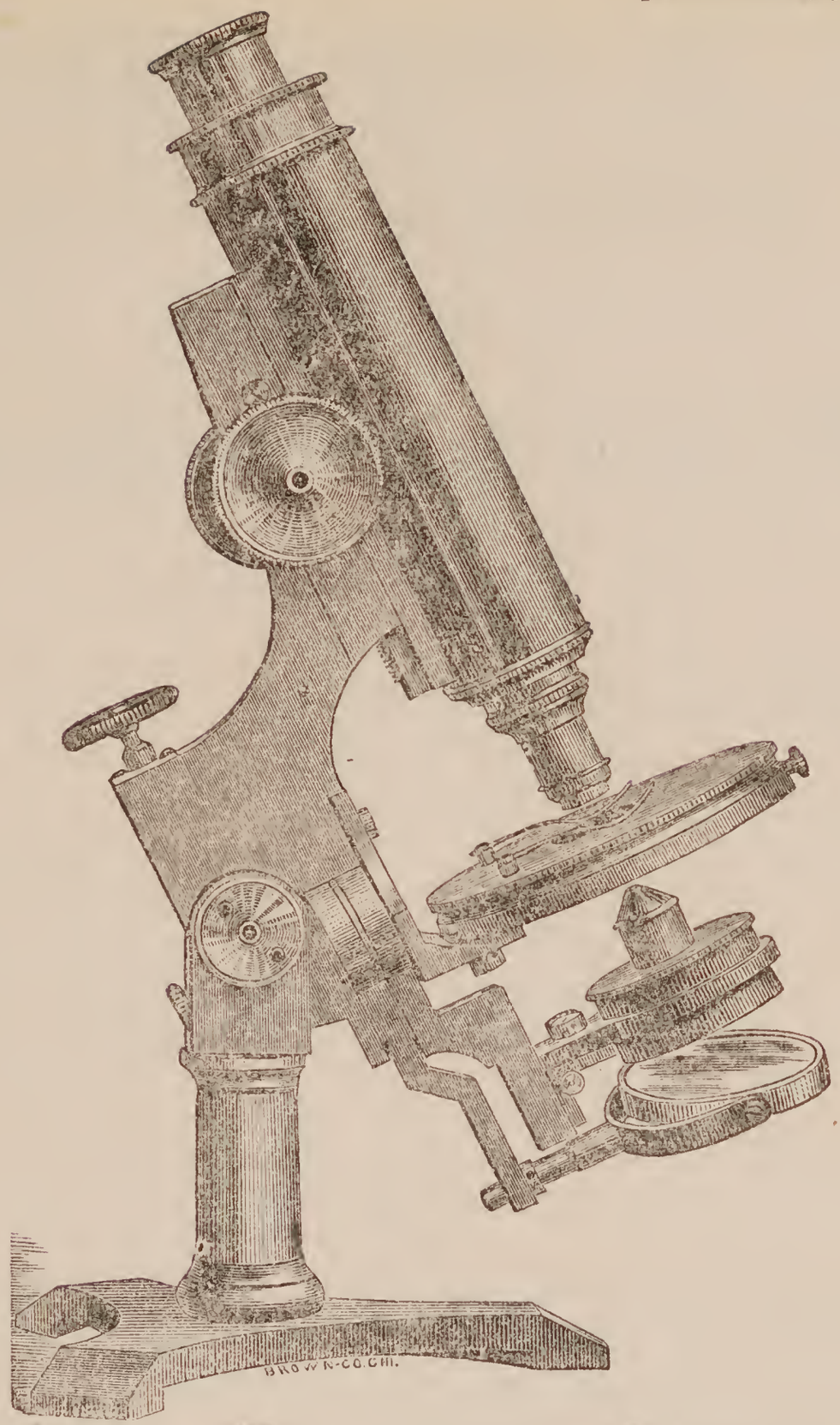

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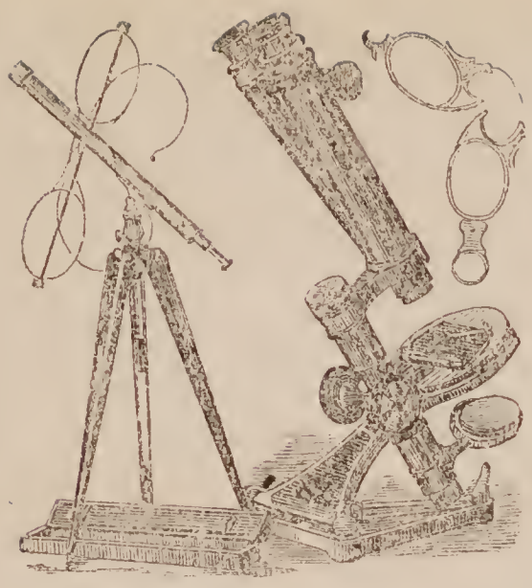

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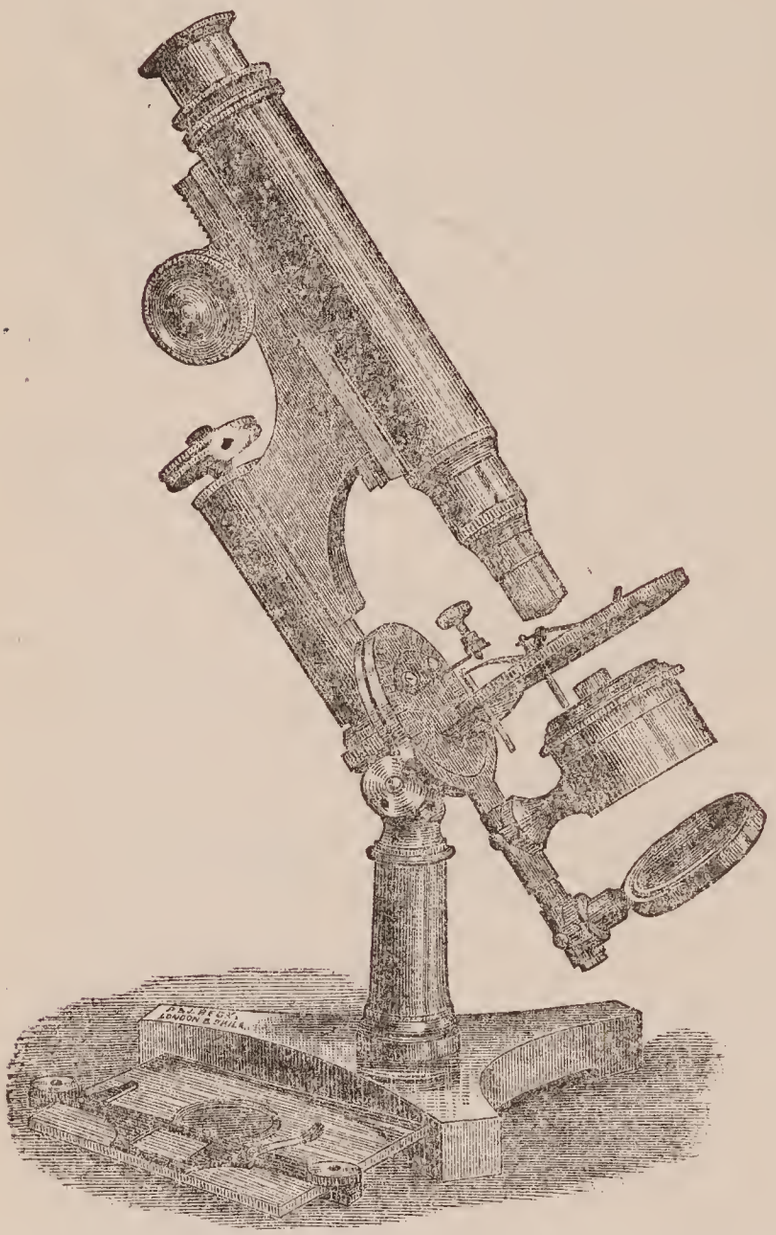

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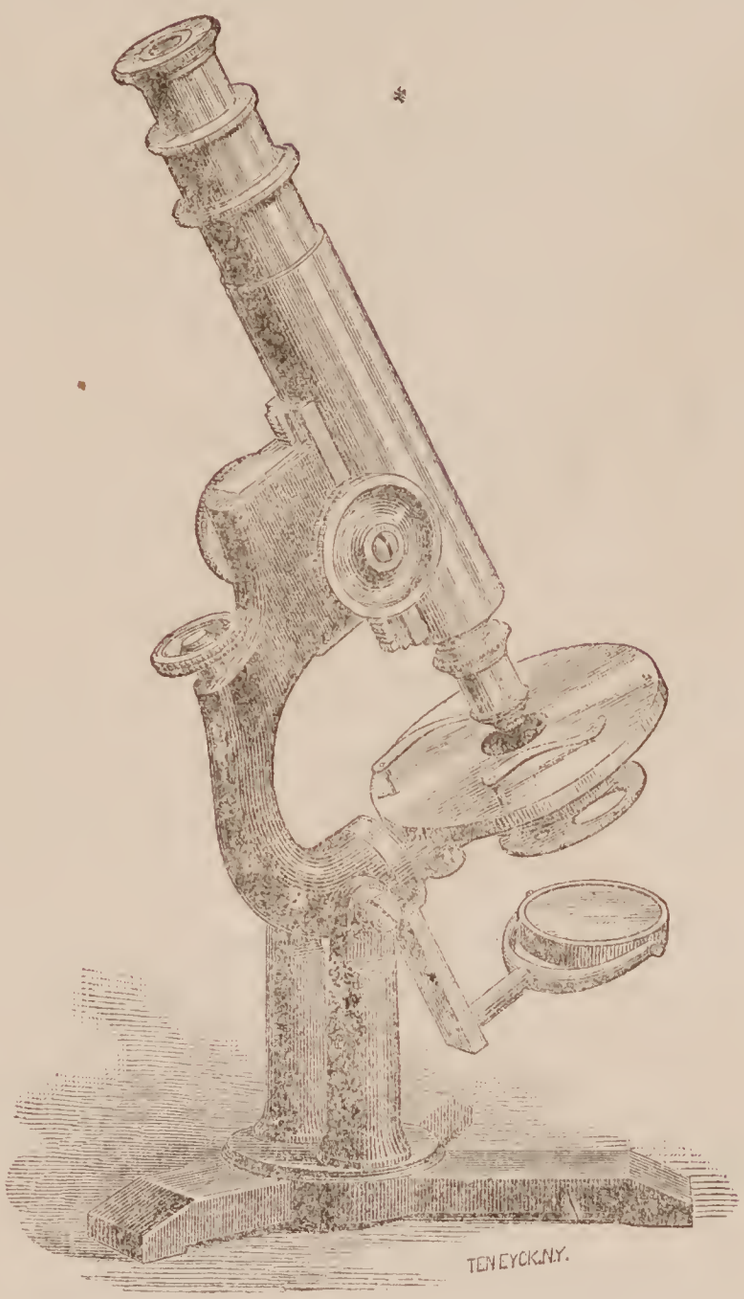

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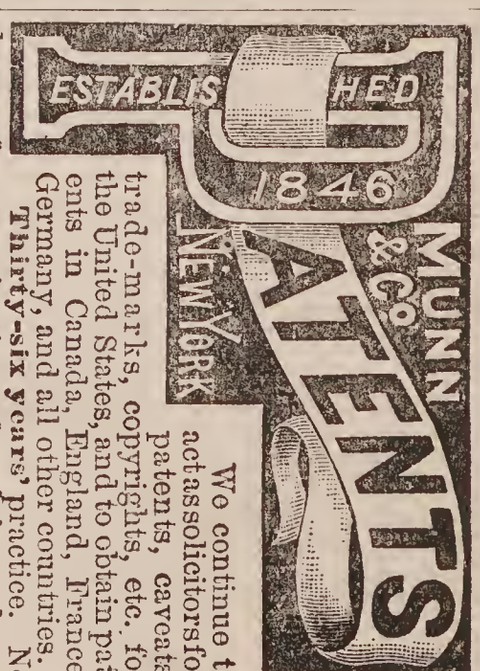

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[Advertising page XX.]

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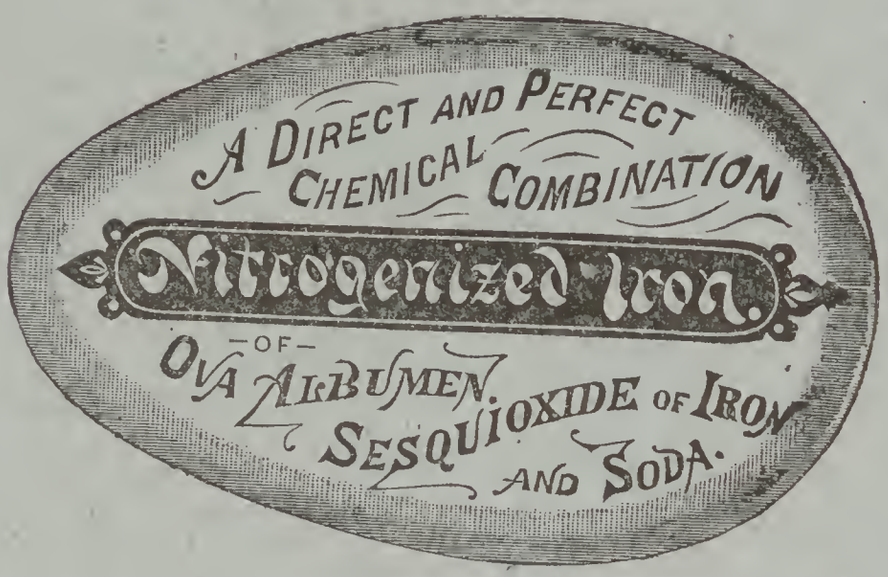

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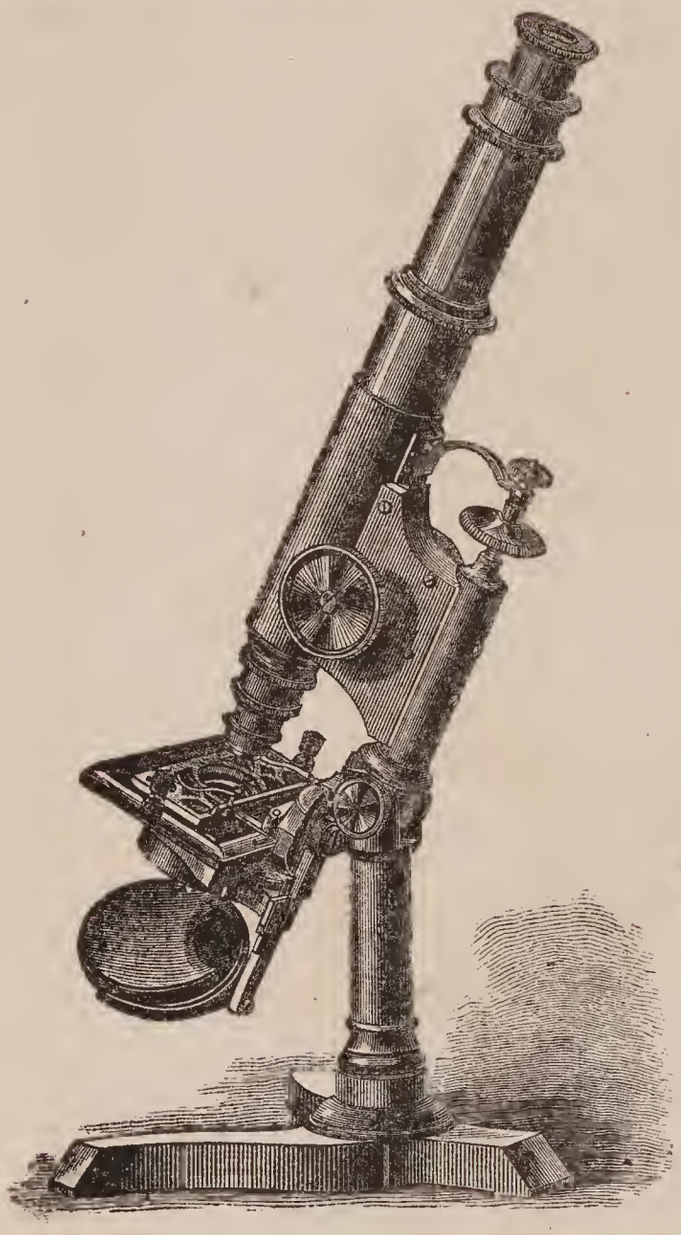

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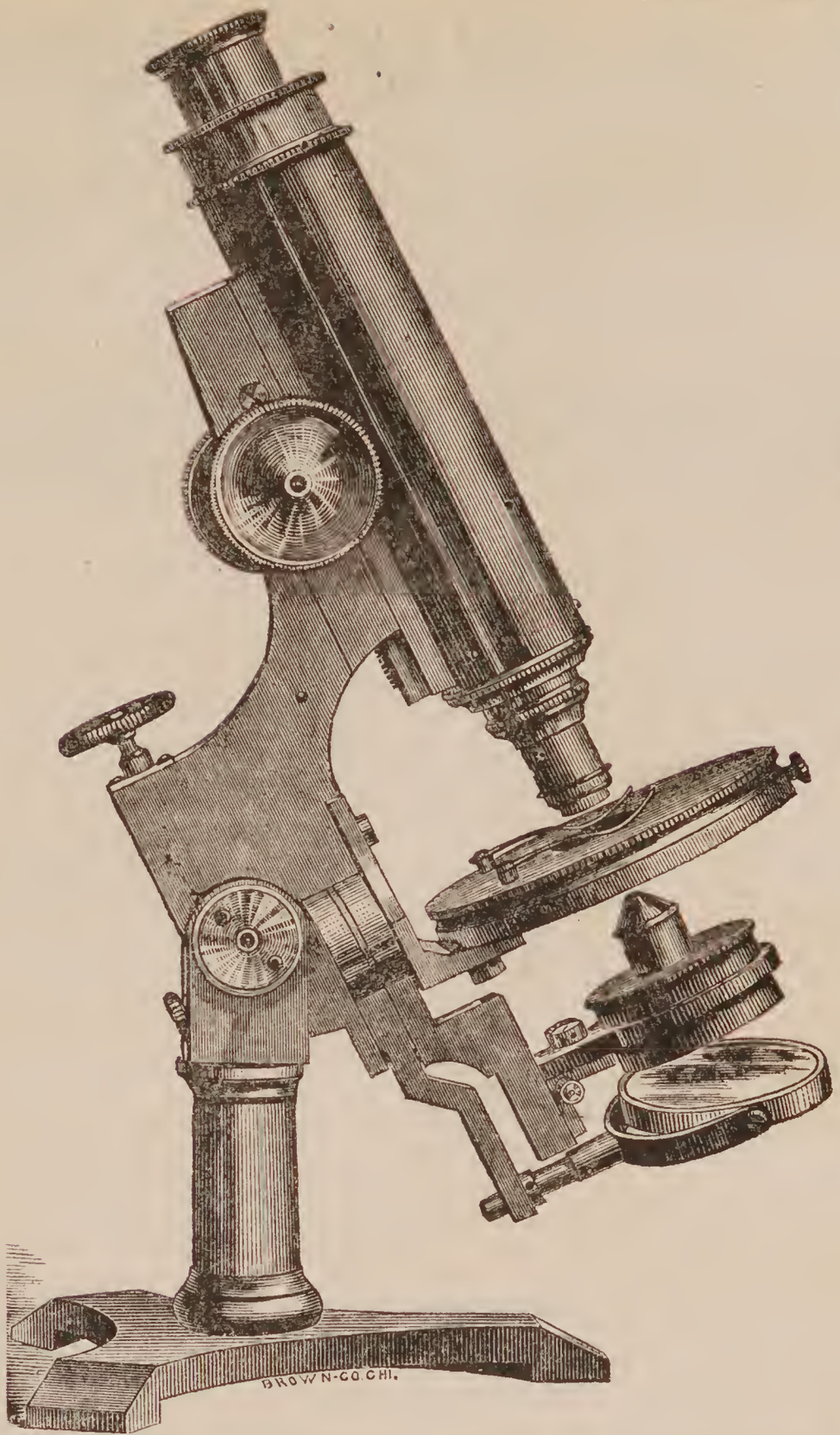

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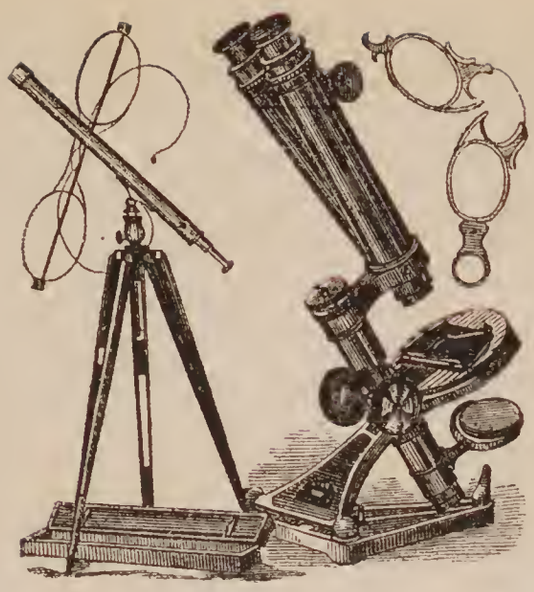

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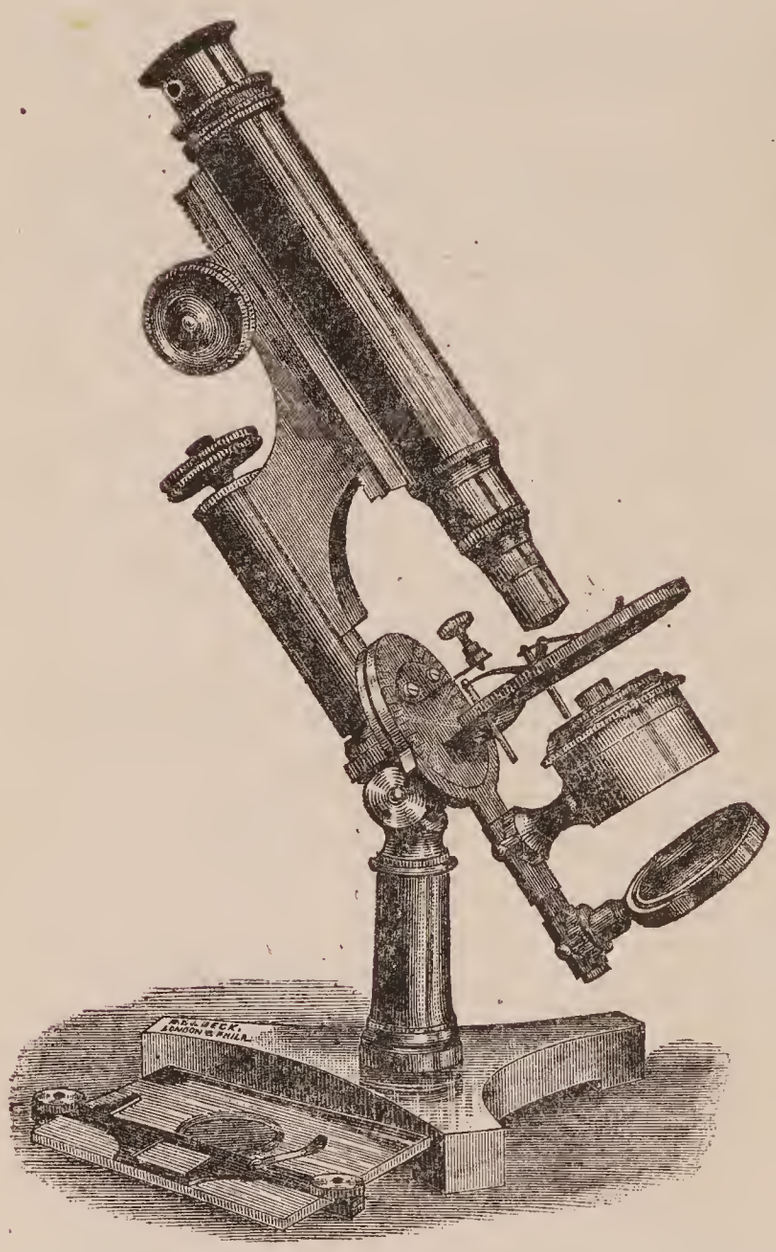

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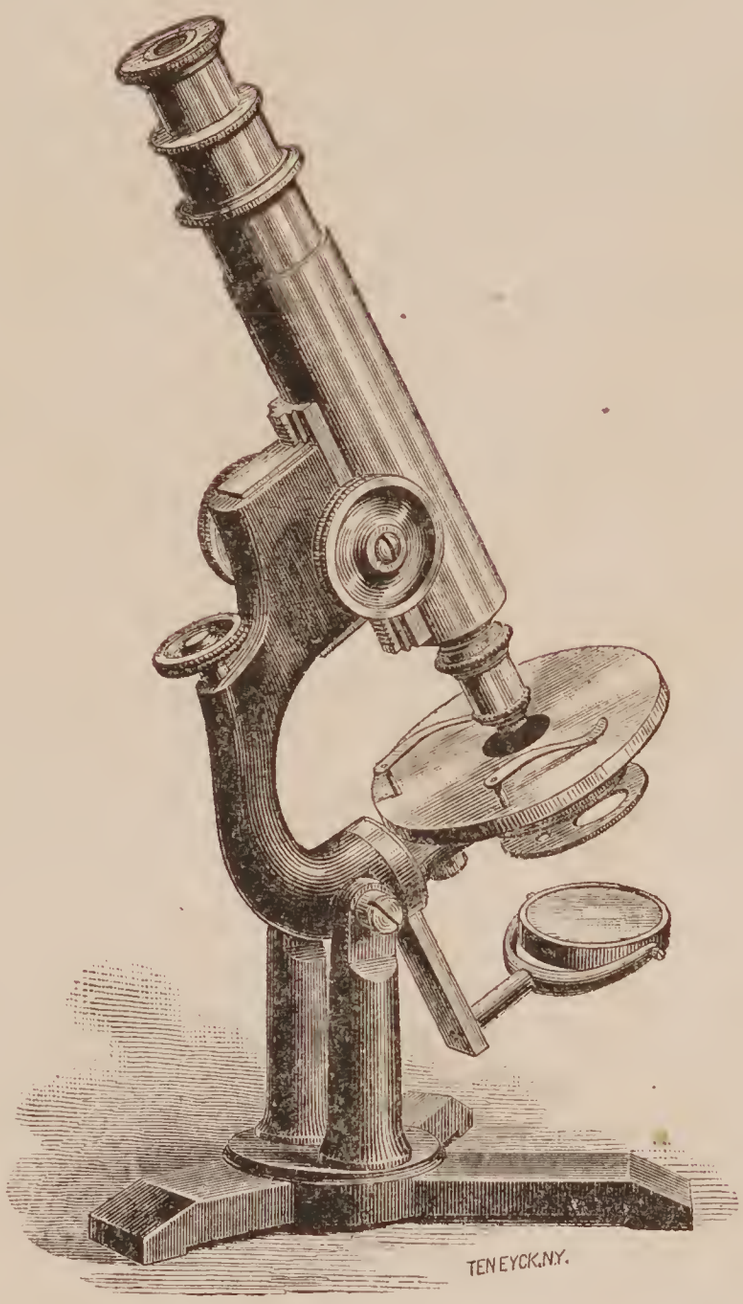

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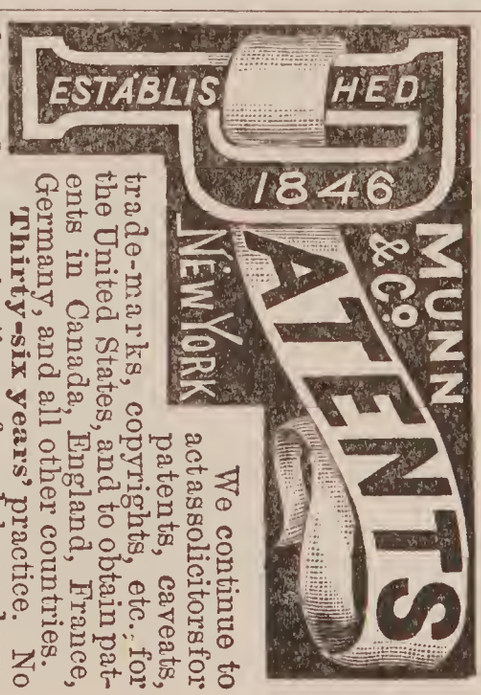

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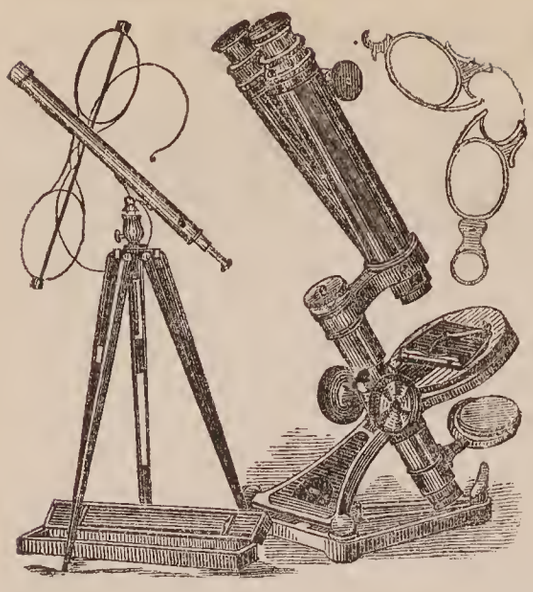

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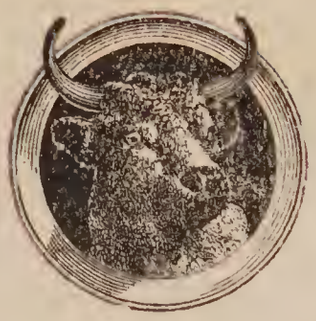

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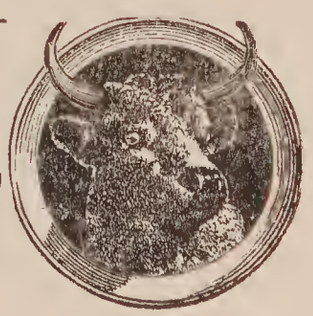

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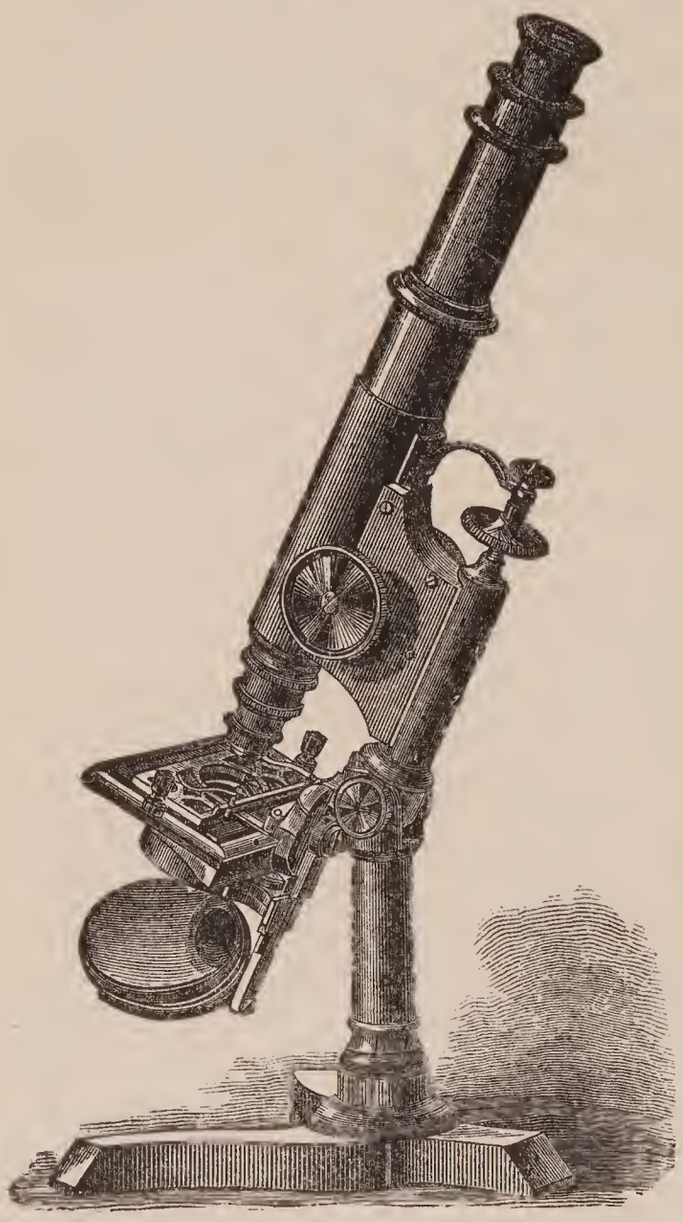

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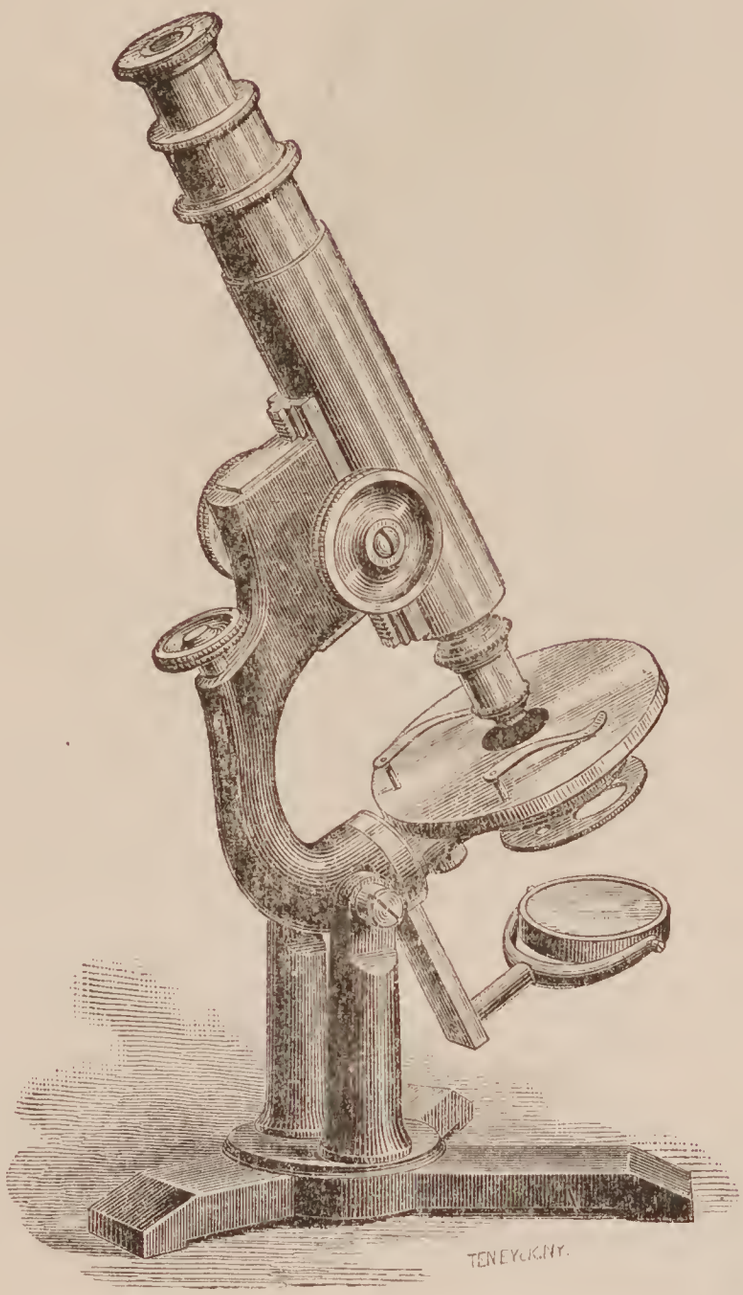

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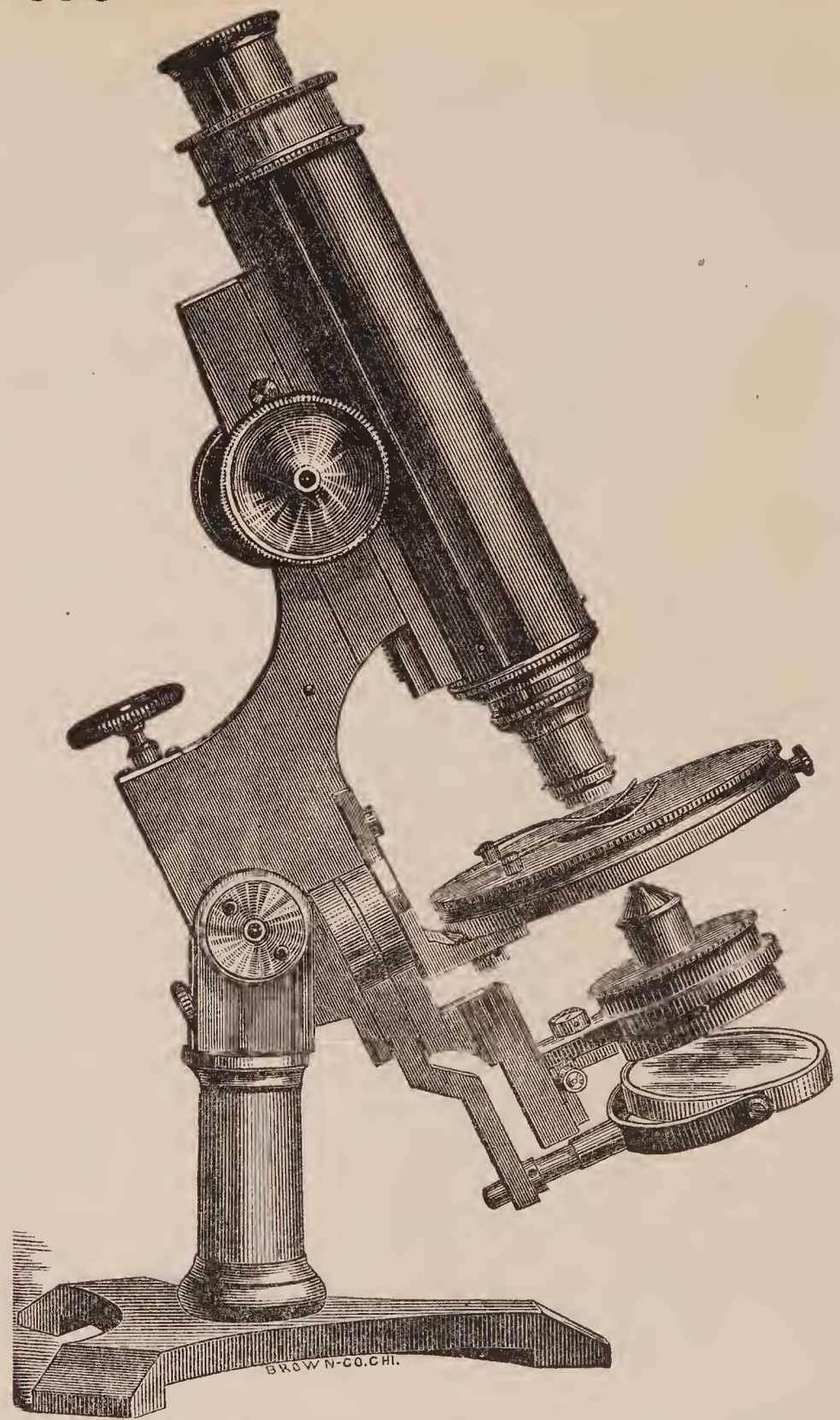

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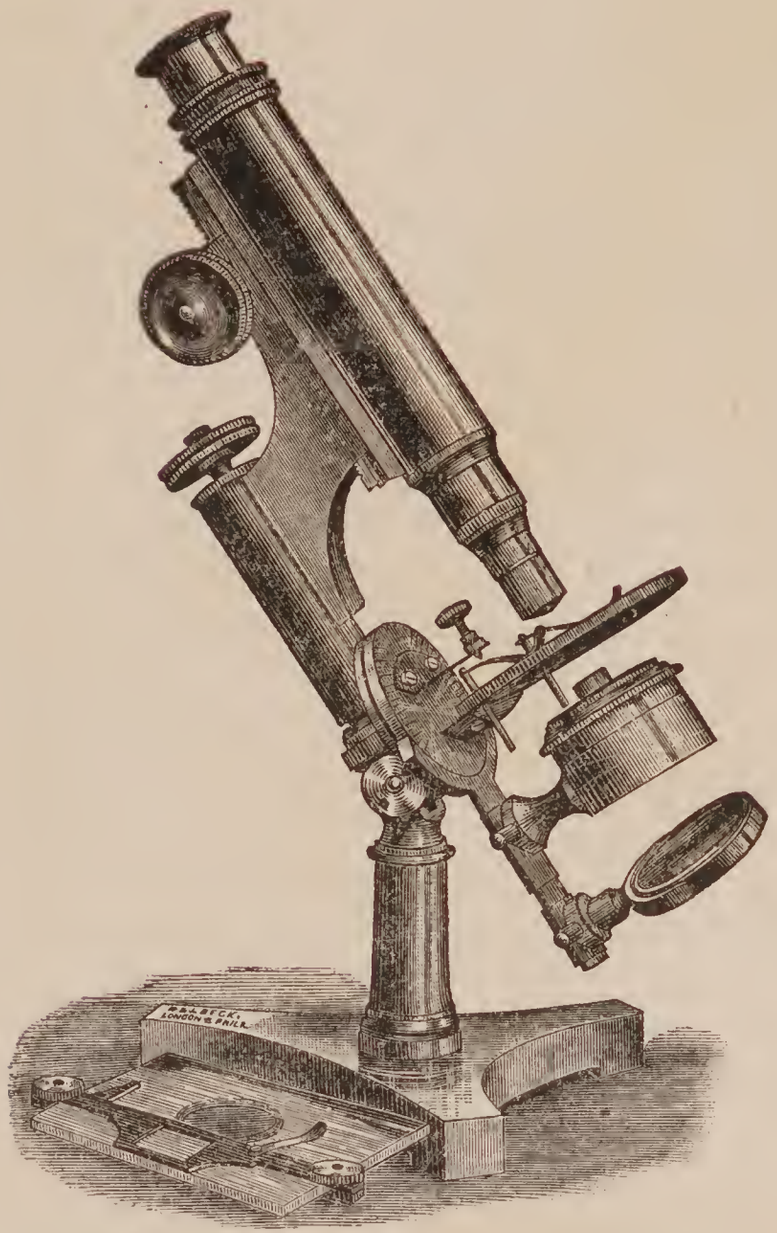

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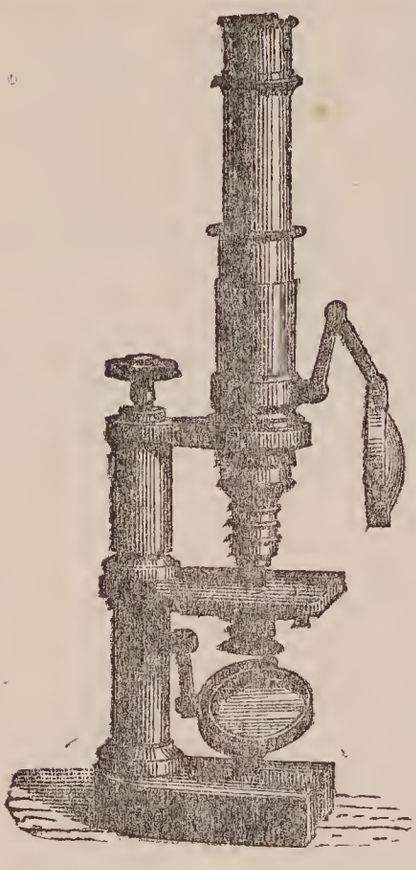

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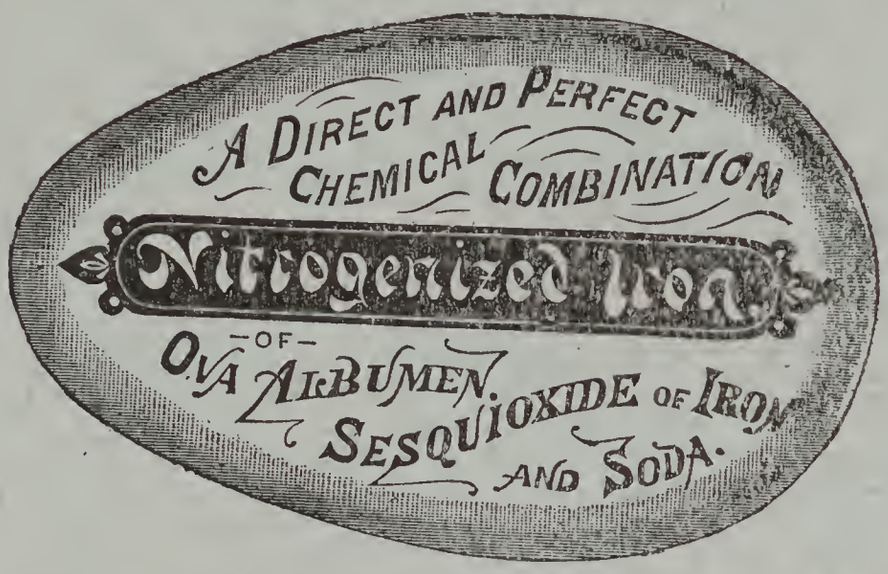

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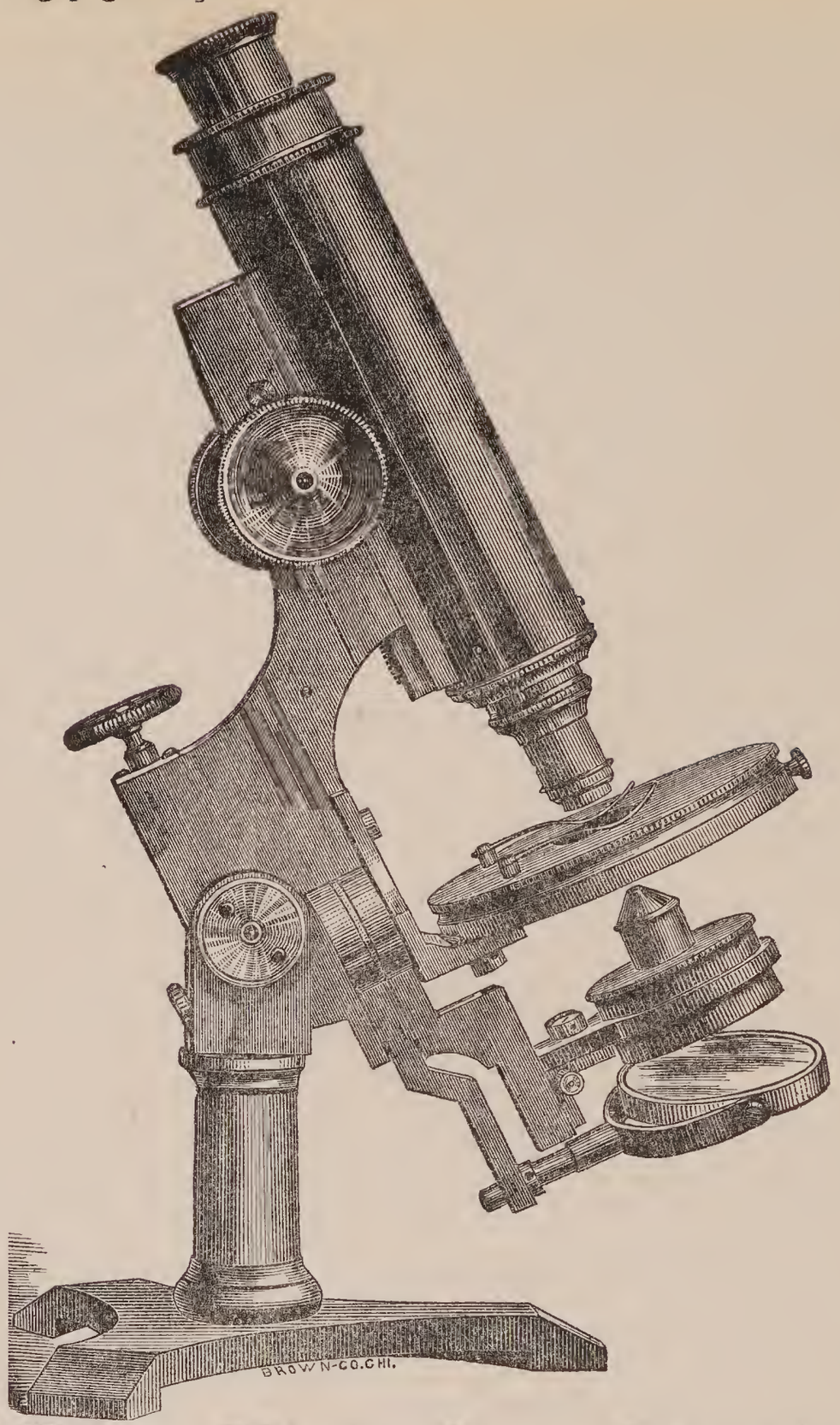

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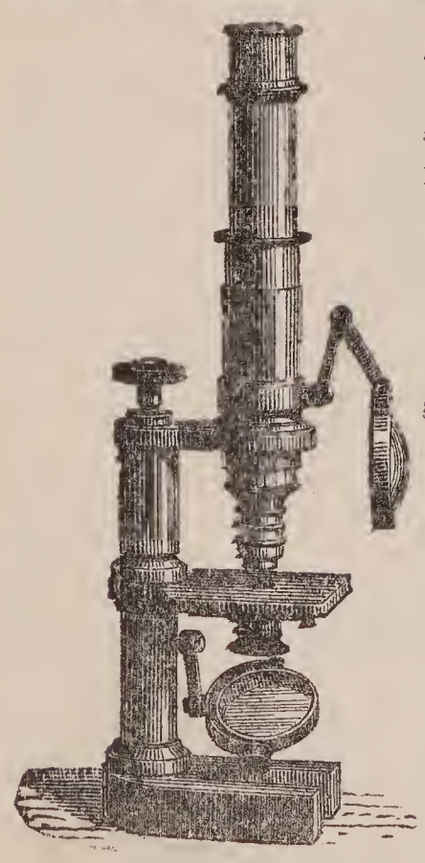

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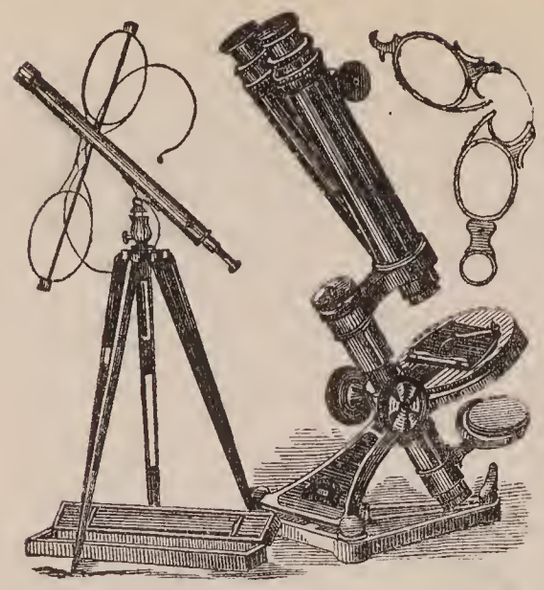

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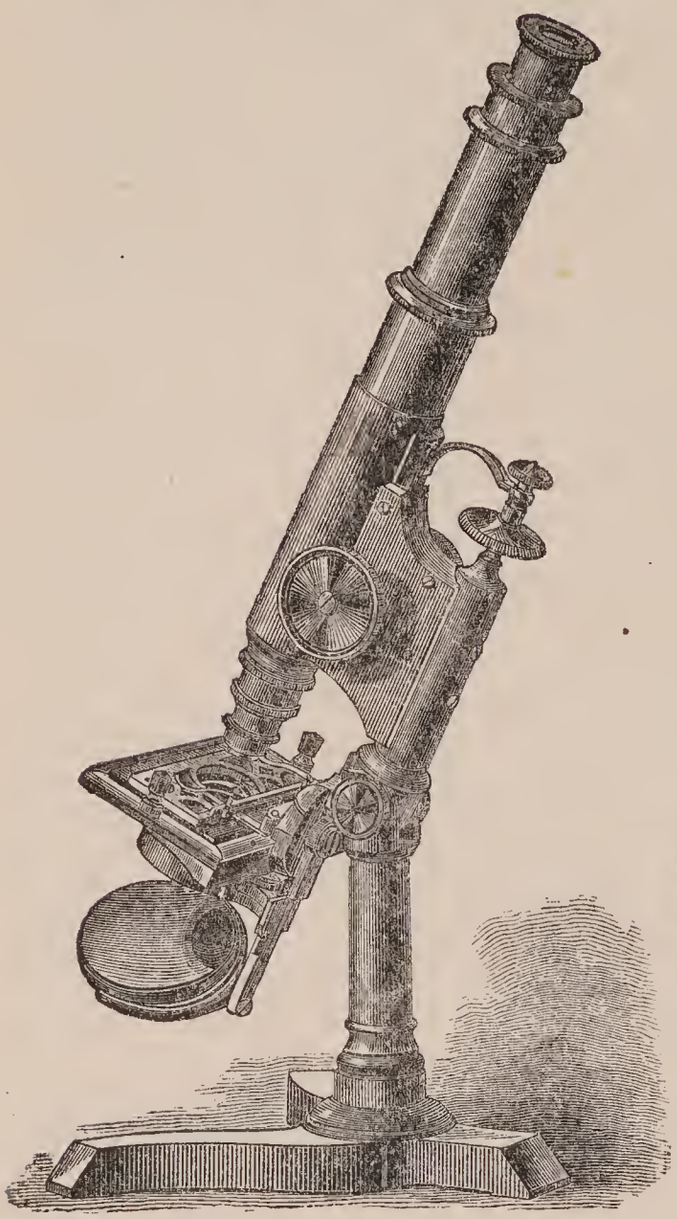

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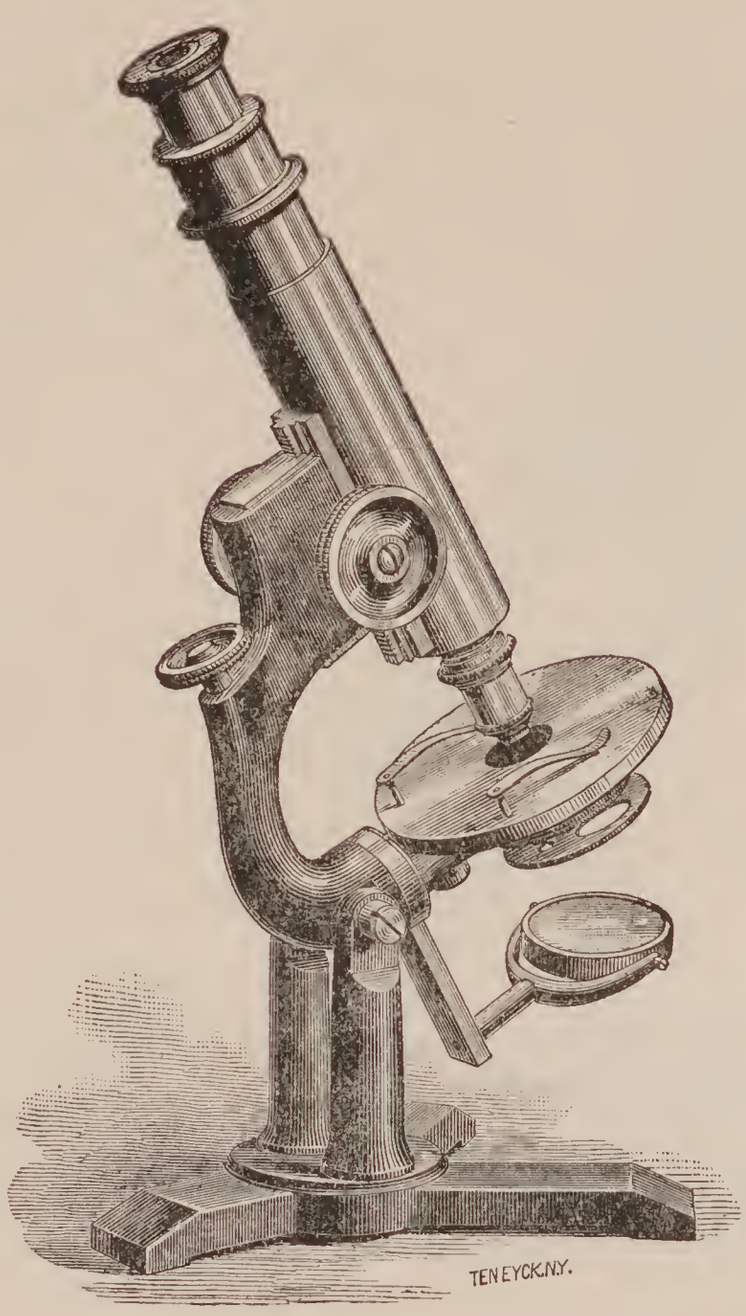

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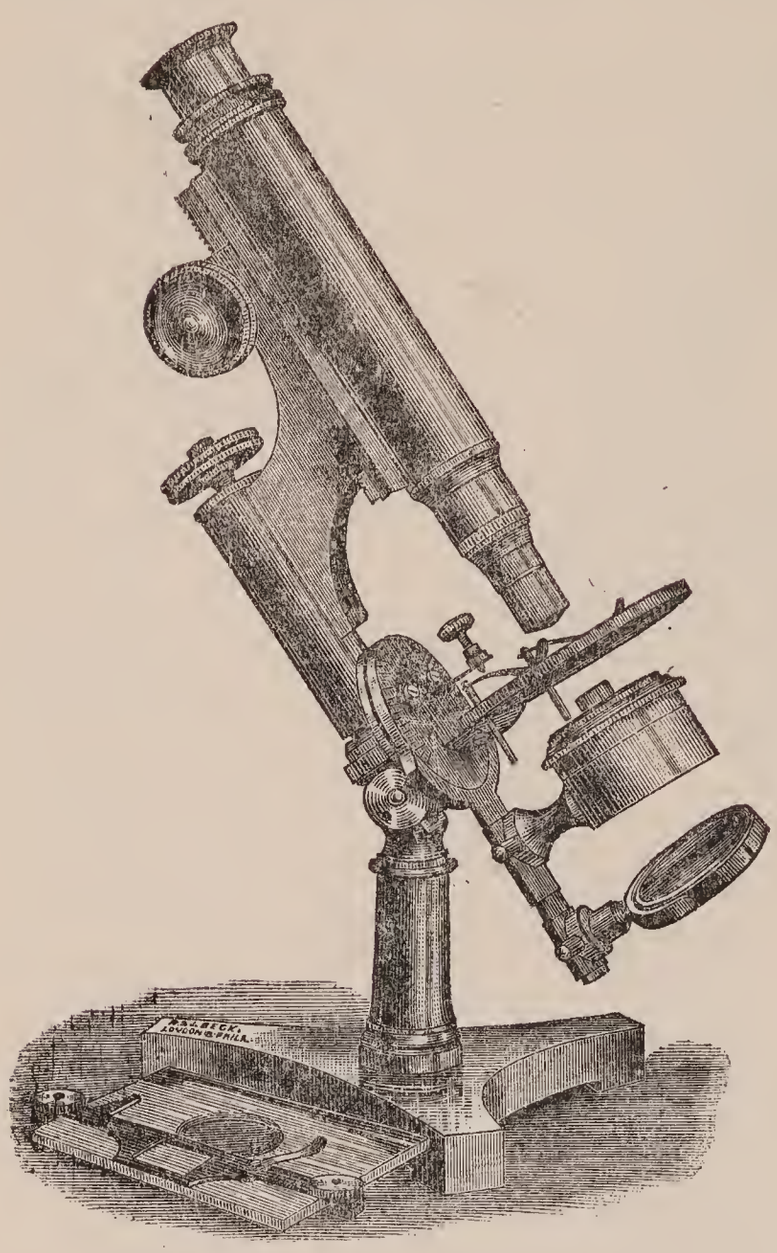

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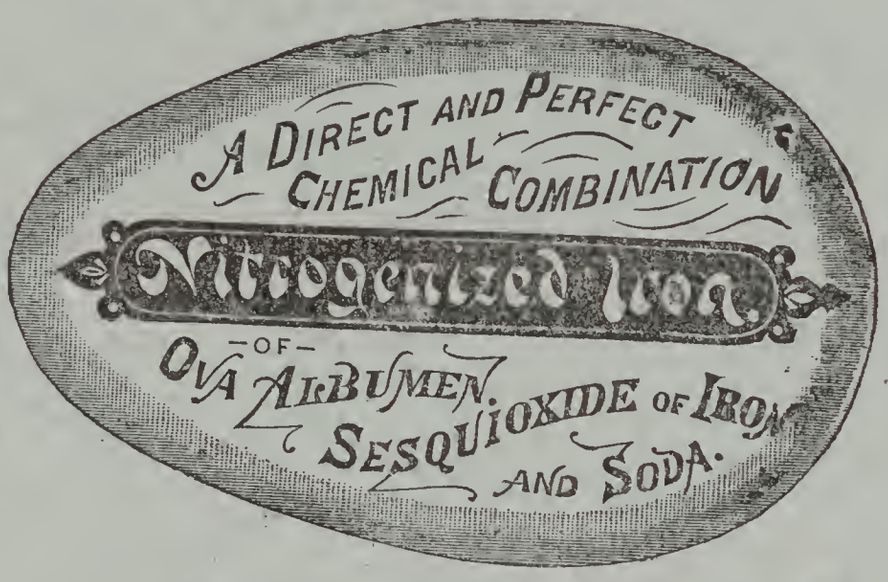

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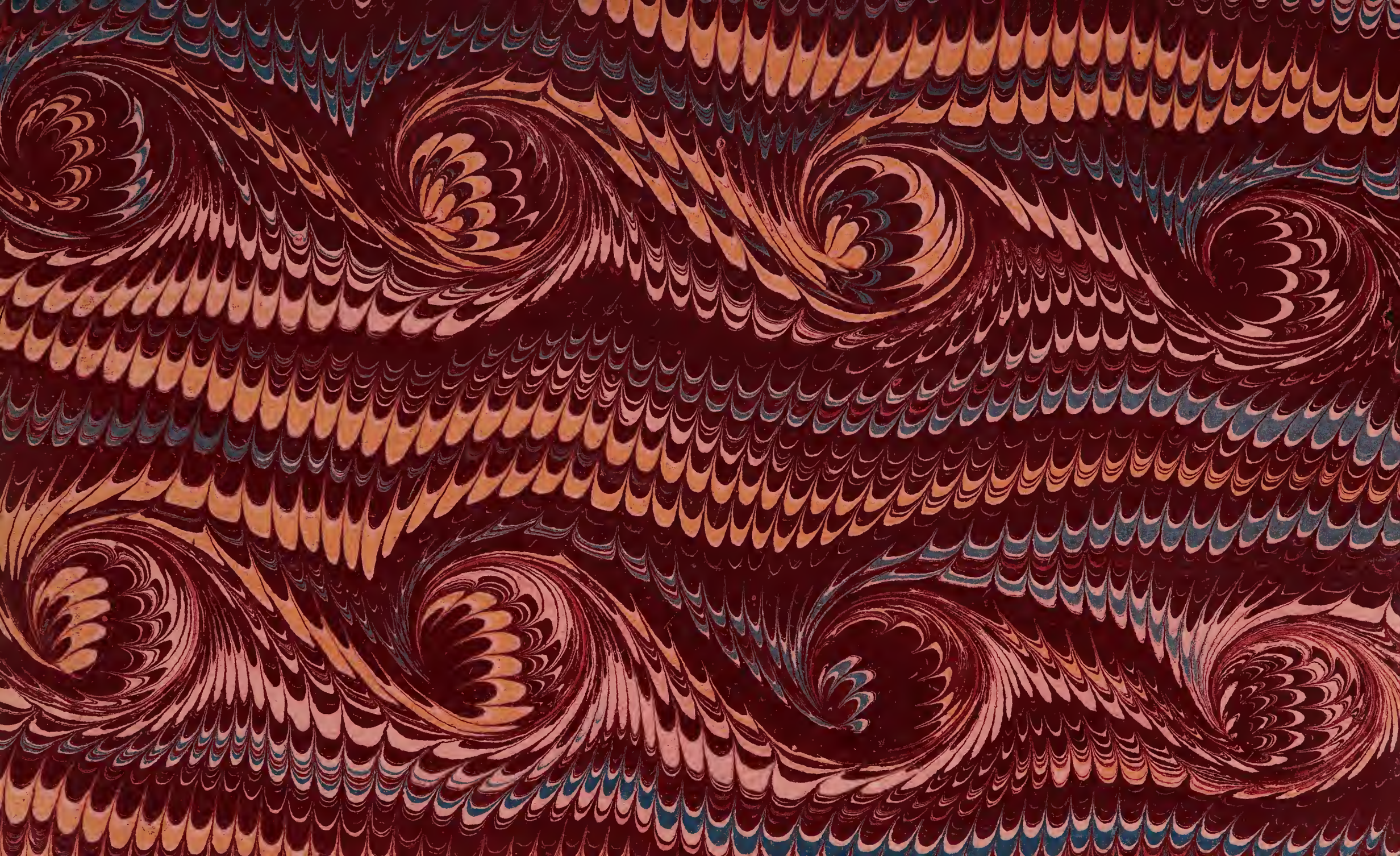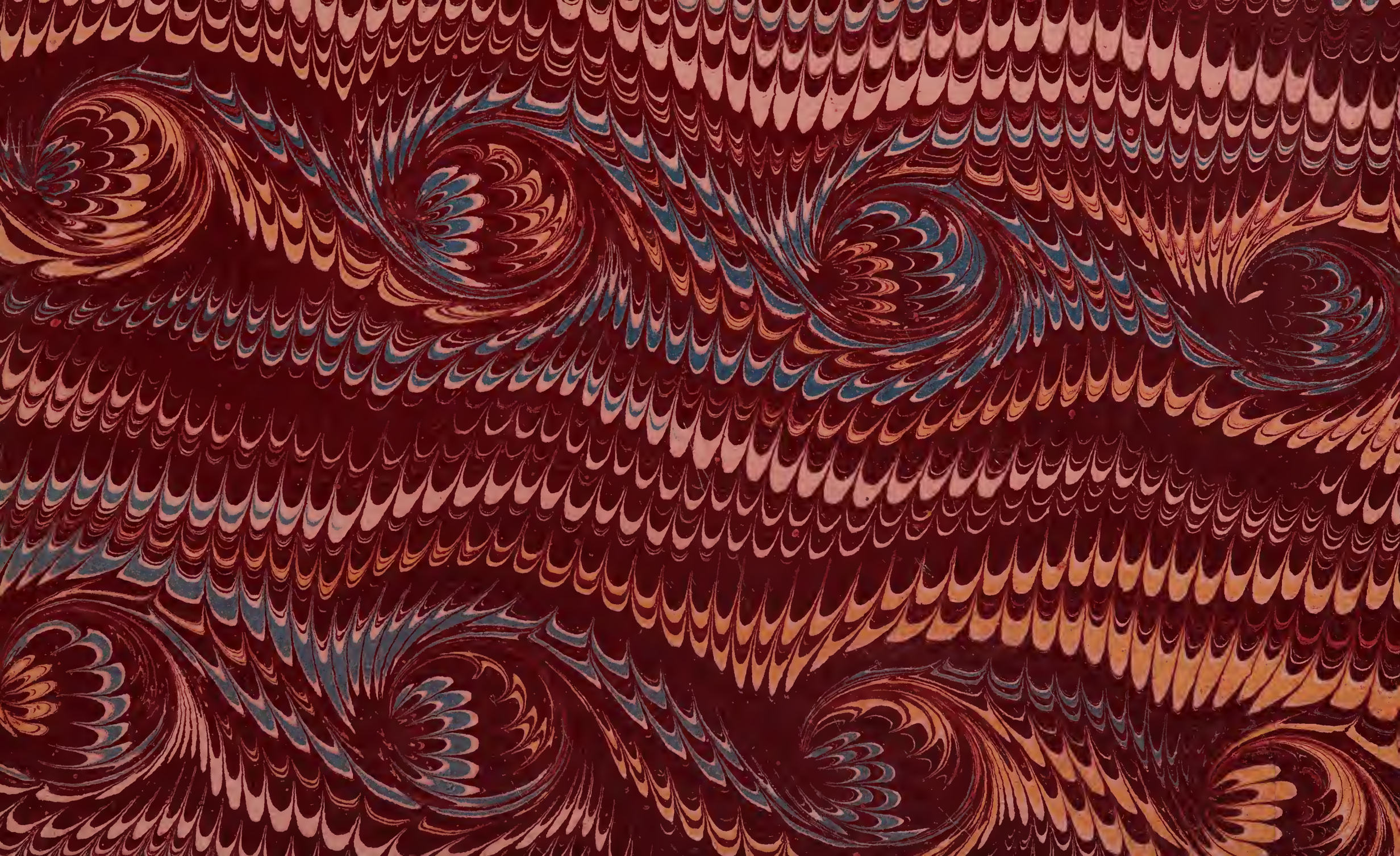
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